PATTERN OF ANORECTAL DISORDERS AND THEIR MANAGEMENT AT A PRIVATE HEALTH CENTER IN SOUTH INDIA

DISSERTATION

Submitted to Texila American University
in partial fulfillment of the requirement for the award of the Degree of

Doctor of Philosophy in Clinical Research

Submitted by

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Under the Guidance of
Dr. Y. N. IRKAL

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GUYANA

CERTIFICATE

This is to certify that the thesis, entitled **"Pattern of Anorectal Disorders and their Management at a Private Health Center in South India"** submitted to the Texila American University, in partial fulfillment of the requirements for the award of the Degree of **Doctor of Philosophy in Clinical Research** is a record of original research work done by **Dr. Amrut Hirulal Basava**, under my/our supervision and guidance and the thesis has not formed the basis for the award of any Degree / Diploma / Associateship / Fellowship or other similar title to any candidate of any University.

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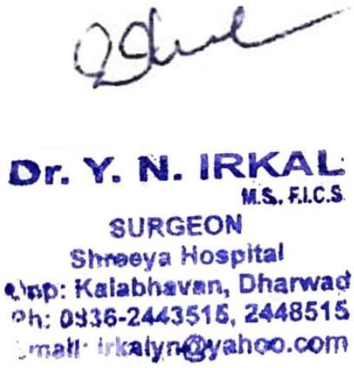

Dr. Y. N. Irkal (Guide)

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DECLARATION

I, Dr. Amrut Hirulal Basava declare that this thesis entitled **"Pattern of Anorectal Disorders and their Management at a Private Health Center in South India"** submitted in partial fulfillment of the degree of **Doctor of Philosophy** is a record of original work carried out by me under the supervision of **Dr. Y. N. Irkal (Guide) and Dr. Raju Karuppal (Co-guide)**, and has not formed the basis for the award of any other degree or diploma, in this or any other Institution or University. In keeping with the ethical practice in reporting scientific information, due acknowledgements have been made wherever the findings of others have been cited.

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Dr. Amrut Hirulal Basava

DEDICATIONS

THIS DISSERTATION IS

DEDICATED TO MY BELOVED

WIFE, MY FAMILY, & ALL MY

LOVED ONES…

ABBREVIATIONS

AD: Anal Dilatation

AJCC: American Joint Committee on Cancer

APR: Abdominoperineal resection

ASCRS: American Society of Colon and Rectal Surgeons

ASTO: Anal sphincter tone optimization

BTX: Botulinum toxin

CAF: Chronic anal fissure

CCB: Calcium channel blockers

CD: Crohn's disease

CMV: Cytomegalovirus

CRM: Circumferential resection margins

CT: Computerized tomography

DGHAL: Doppler-guided hemorrhoidal artery ligation

DNA: Deoxyribonucleic acid

DRE: Digital rectal examination

EGFR: Epidermal growth factor receptor

EUA: Examination under anesthesia

FAP: Familial adenomatous polyposis

FI: Fecal incontinence

GA: General anesthesia

HIV: Human immunodeficiency virus

HNPCC: Hereditary non-polyposis colorectal cancer

HPV: Human papilloma virus

HRT: Hormone replacement therapy

HSV: Herpes simplex virus

I & D: Incision and drainage

IBD: Inflammatory bowel disease

IBS: Irritable bowel syndrome

IBS-C: Irritable bowel syndrome with constipation

IPD: In-patient department

LAD: Lord's Anal Dilatation

LAR: Low anterior resection

LAS/LIS/LIAS: Lateral anal sphincterotomy/Lateral internal sphincterotomy/Lateral internal anal sphincterotomy

LIFT: Ligation of intersphincteric fistula tract

MIPH: Minimally invasive procedure for hemorrhoids

MPPF: Micronized purified flavonoid fraction

MRI: Magnetic resonance imaging

MS: Microsoft

NHS: National Health Service

NSAIDs: Non-steroidal anti-inflammatory drugs

OPD: Out-patient department

OT: Operation theatre

PEG: Polyethylene glycol

PPH: Procedure for prolapse and hemorrhoids

PR: Per rectum

RBL: Rubber band ligation

RCT: Randomized controlled trial

RFA: Radiofrequency ablation

SA: spinal anesthesia

SD: Standard deviation

SGA: Short general anesthesia

SH: Stapler hemorrhoidopexy

SPSS: Statistical Package for the Social Sciences

SRUS: Solitary rectal ulcer syndrome

STI/STD: Sexually transmitted infection/sexually transmitted disease

TAE: Transanal excision

TB: Tuberculosis

THD: Transanal hemorrhoidal dearterialization

TNFa: Tumour necrosis factor alpha

TNM: Tumour, Node, Metastasis

TRUS: Transrectal ultrasonography

UC: Ulcerative colitis

UICC: Union for International Cancer Control

VAAFT: Video-assisted anal fistula treatment

VAS: Visual analogue scale

VEGF: Vascular endothelial growth factor

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INTRODUCTION

Anorectal disorders are commonly encountered in our surgical practice. Anorectal conditions cause significant disability and discomfort to the patient and negatively affect their quality of life. These are the common reasons for patients to consult healthcare specialists, including primary care physicians, surgeons and gastroenterologists. The prevalence of anorectal disorders in the general population is much higher than that observed by the clinicians, because most patients with symptoms of anorectal disorders do not seek medical consultation, commonly because of shyness, ignorance, awkwardness, or lack of awareness. The commonly manifested symptoms include: anal pain, bleeding, burning/itching sensation, mass protrusion, swelling, constipation, diarrhea, seepage, discharge (pus or mucus), and incontinence. Multiple, overlapping symptoms can often be present which can cause significant dilemmas during diagnosis and management. Various structural, neuromuscular, and functional disorders have been described and included within the group of anorectal disorders. Literature mentions common anorectal conditions, which include: hemorrhoids, anal fissures, fistula-in-ano, anorectal abscesses (rectal/perianal abscess), proctitis, rectal polyps, rectal prolapse, rectocele, solitary rectal ulcer syndrome, proctalgia fugax, levator ani syndrome, dyssynergic defecation, pruritus ani, rectal foreign bodies, fecal incontinence, pilonidal sinus disease, anal warts, and anorectal (colorectal) cancers. Furthermore, there are certain rare anorectal conditions, such as adult colorectal intussusception. Diagnosis is based on the detailed history, physical examination (including inspection and digital rectal examination), and use of selected investigations. Dietary modifications, lifestyle changes and regulation of bowel habits are often the basic management of most of the anorectal disorders. Conservative medical, non-operative interventions and surgical management options have been practiced based on the diagnosis of anorectal disorders.

In the Indian Scenario, there is a lack of epidemiological knowledge and awareness regarding the anorectal disorders among the general public. The anorectal disorders are generally observed in the young and middle-aged population, with a male preponderance.

Hemorrhoids, anal fissures, and fistula-in-ano are, by far, the commonest anorectal disorders encountered. Constipation, poor perineal hygiene and pregnancy (in females) have been established as the commonest risk factors for anorectal pathologies.

Identifying and defining the research problem:

Anorectal disorders are common distressing (sometimes debilitating) problems in patients which significantly add to the burden of healthcare costs. Most of them tend to tolerate the symptoms for prolonged periods and often hesitate to consult the doctor due to ignorance, shame or other reasons. Females are especially reluctant in consulting doctors for their anorectal conditions and they tend to neglect and prolong their disease. This concealment of anal symptoms can lead to late diagnosis and treatment, and potential complications. Anorectal conditions have a significant negative impact on the quality of life of patients, and potentially consume a large proportion of healthcare costs. Hence, it is emphasized to study anorectal disorders and utilize the research data for better awareness and management of such conditions. Furthermore, it is often difficult to distinguish between "organic" and "functional" anorectal disorders in some patients. We have primarily considered benign "organic" anorectal conditions for our study, because the "functional" pathologies are often managed on an out-patient basis and physiotherapy (biofeedback).

This research aims to retrospectively study the pattern of anorectal disorders presenting at our hospital for a period of 1 year, their epidemiological distribution as well as their surgical management. The patients mainly belonged to various regions of Karnataka, Goa, and Maharashtra states. The study variables include age, sex, clinical presentation (symptoms/signs), diagnosis and surgical treatment done. The research setting being Shreeya Multispecialty hospital located in Dharwad city of Karnataka, which has been a well-known, well-established, and dedicated service provider for such anorectal disorders for several years. The expected output for this study includes: provision of annual report related to the anorectal conditions managed at our hospital with desirable outcomes. The necessary improvisations in the surgical management services may be implemented in future

depending on the observations of the research study. Publications and conference presentations pertaining to anorectal disorders have been done to share the information.

Societal and scientific relevance:

This observational study is especially valuable in epidemiology related to a common public health concern, viz. anorectal disorders. We aspire to share detailed knowledge and awareness about various anorectal conditions and their clinical aspects among the general public. The stigma and shame associated with the conserved mentality of the society must be curbed, such that they don't neglect any anorectal symptoms. It is imperative for the women to be aware of such condition, overcome their shyness, and consult the doctor. The understanding of the public encourages them to seek timely and appropriate medical attention as and when required. We also enthusiastically share the experiential knowledge among the medical professionals for better management of anorectal disorders. Appropriate surgical management and their satisfactory outcomes have been emphasized in this study.

OBJECTIVE OF THE STUDY

The ***Aims and objectives*** of this study are:

- To study the demographic profile of anorectal disorders (age and sex distribution)
- To study the symptomatology of various anorectal disorders
- To study the proportion of various anorectal disorders
- To study the incidence of anorectal malignancy
- To study the surgical management of anorectal disorders (along with the outcomes)

REVIEW OF LITERATURE

Anorectal conditions are common healthcare problems, which are often neglected and overlooked by the patients until it causes severe discomfort. Commonly encountered anorectal conditions include anal fissures, hemorrhoids, perianal abscess, fistula-in-ano, rectal prolapse, anorectal cancers, and rectal polyps. These conditions cause significant disability and discomfort to the patient and negatively affect their quality of life. With appropriate history and physical examination, these conditions can be diagnosed and subjected to guidelines for comprehensive evaluation and management. The main purpose of our study is to determine the pattern of anorectal disorders which were surgically managed at our private health center in South India. The anatomical and physiological aspects of anorectal region are considered first, and the common anorectal disorders have been elaborated thereafter.

Anatomical and Physiological Background:

The rectum is the lower part of the large intestine which measures about 15 cm, and is located around the midline of the pelvis. The anus is the distal-most part of the gastrointestinal system. The proximal extent of rectum, i.e. rectosigmoid junction, is defined as the level of confluence of the taeniae coli where the colon redirects anteriorly, away from sacrum (*Anorectal Cancer: Critical Anatomic and Staging Distinctions That Affect Use of Radiation Therapy*, 2015). The distal extent of rectum is marked by the proximal anorectal sphincter, which is nothing but the palpable upper border of the puborectalis muscle (Matalon et al., 2015). The proximal third of the rectum is covered with peritoneum antero-laterally; the middle-third is partly covered with peritoneum; while the distal third is completely extraperitoneal and surrounded by mesorectal lymph nodes, blood vessels, and perirectal fat, altogether enclosed by the mesorectal fascia (*Anorectal Cancer: Critical Anatomic and Staging Distinctions That Affect Use of Radiation Therapy*, 2015). This mesorectal fascia merges below along with the anal sphincter. The anal sphincter consists of

two parts, the internal sphincter (smooth muscles) and the external sphincter complex (skeletal muscles). The inner circular muscle layer of rectal wall continues as the internal anal sphincter. The external anal sphincter complex consists of various components which include the lowermost part of the levator ani muscle, puborectalis muscle, and the superficial, subcutaneous, and deep external sphincter muscles (Matalon et al., 2015). The anal canal is usually 3-6 cm in length and extends from the anal sphincter to the anal verge. The anal margin refers to the radial extent of about 5-6 cm, from the anal verge to the external skin covering (Matalon et al., 2015). The vascular supply of anorectal region is derived from superior, middle and inferior rectal arteries, and also branches from lower sacral artery (Filippo La Torre et al., 2017). Superior rectal artery arises from inferior mesenteric artery, middle rectal artery arises from internal iliac artery, and inferior rectal artery arises from internal pudendal artery (Filippo La Torre et al., 2017).
The submucosal venous (or hemorrhoidal) plexus forms the internal and external hemorrhoidal plexus above and below the dentate line, respectively (Filippo La Torre et al., 2017). These venous plexus further drain into the superior, middle, and inferior hemorrhoidal veins. For instance, the dentate line also represents connection between porto-systemic circulations; the proximal region enters the portal system through superior hemorrhoidal vein and inferior mesenteric vein; the distal region enters the systemic (venacaval) circulation through the middle and inferior hemorrhoidal veins and the hypogastric veins (Filippo La Torre et al., 2017). The lymphatic drainage of the anorectal region involve the mesenteric and inguinal groups (Matalon et al., 2015); the upper rectum drains through the superior rectal nodes into the inferior mesenteric nodes, the lower rectum drains through the middle rectal nodes into the internal iliac nodes; and the anal canal drains through the inferior rectal nodes into the inguino-femoral nodes (Matalon et al., 2015). The anorectum is held into position by the essential supports in the form of pelvic floor musculature forming the levator ani; this consists of three parts, namely, pubococcygeus, puborectalis, and ileococcygeus. The levator ani stabilizes the floor of the pelvis by protecting against the elevated pressure within the abdomen (Filippo La Torre et al., 2017).

Anorectal region receives innervations from sympathetic and parasympathetic nervous system. The sympathetic nerve supply arises from the L1, L2, and L3 levels, which

eventually enter into the superior hypogastric plexus or presacral nerve (Filippo La Torre et al., 2017). The parasympathetic innervation arises from the S2, S3, & S4 roots in the form of pelvic splanchnic or erigentes nerves (Filippo La Torre et al., 2017). Pudendal nerve arises from sacral plexus (S2-4), and provides sensorimotor supply to the external sphincter and perianal region (Filippo La Torre et al., 2017). The internal sphincter mainly works as a reflex controlled by the sympathetic and parasympathetic innervations. The sensory innervation is derived from the internal pudendal nerve, along with the parasympathetic and sympathetic branches (Filippo La Torre et al., 2017). The importance of sensory innervation is mainly to determine discriminate the type of constituents within anus, evacuation and continence (Filippo La Torre et al., 2017). The nerve centers of control are placed at 3 levels: the Meissner's and Auerbach's plexus (comprising the enteric nervous system), the autonomic nervous system (sympathetic and parasympathetic), and the cerebrospinal axis (Filippo La Torre et al., 2017).

The histology of the rectal mucosa consists of a columnar epithelium consisting of goblet cells, endocrine cells, and absorptive cells; this columnar epithelium changes into the squamous epithelium of the anal mucosa at the level of the dentate line (Matalon et al., 2015). There are valves of Houston (superior, middle, and inferior) in the rectum, which are prominent mucosal folds and not true valves. The dentate line (also called as "pectinate line") is considered as both microscopic and macroscopic landmark, as there are visible mucosal indentations (crypts) formed by the anal glands and vertical columns of Morgagni in the mucosa of the rectum (Matalon et al., 2015). The base of the anal columns has semilunar valves which create the pectineal line along the circular course (Filippo La Torre et al., 2017). The dentate line represents the developmental junction of the hindgut-proctodeum, and this line anatomically divides the upper two-third and the lower third of the anal canal (Wikipedia Contributors, 2021). The anocutaneous line, also known as the "White line of Hilton" or "intersphincteric groove" lies slightly below the pectinate line and represents a landmark for the intermuscular border between the external and internal anal sphincter muscles (Wikipedia Contributors, 2021). This anocutaneous line also represents the transition point from the non-keratinized stratified squamous epithelium of anal canal to the keratinized stratified squamous epithelium of the anus and perianal skin (Wikipedia

Contributors, 2021). The dentate line can be correlated with the lymphatic drainage of the anorectal region; tumours located above dentate line drain into mesorectal, presacral, and internal iliac nodes; whereas tumours located below the dentate line drain into inguinal and femoral nodes (Matalon et al., 2015). For practical purposes, the dentate line and pectineal line can be used interchangeably; the dentate line is an important anatomical landmark which divides the upper mucosal or columnar epithelium from the lower squamous epithelium. The dentate line is marked by the presence of the anal crypts of Morgagni which are drained by four to eight anal glands; most anorectal abscesses and fistulae originate from these anal glands (Pfenninger & Zainea, 2001). Another important aspect of the dentate line is that it outlines the termination of sensory nerve supply (Pfenninger & Zainea, 2001); above this level, the rectum has no pain nerve fibers but supplied by the stretch nerve fibers. Due to this reason, many surgical procedures above the dentate line can be performed without anesthesia. On the contrary, there is extreme sensitivity below the dentate line, making the perineal region among the body areas with maximum sensitivity (Pfenninger & Zainea, 2001).

Rectal wall has various layers (extending outwards) as follows (Matalon et al., 2015):

- Mucosa (which includes lamina propria and muscularis mucosa)
- Submucosa
- Muscularis propria (which includes inner circular and outer longitudinal layers)
- Serosa

The neurophysiological functions of the anorectal region involve the fecal continence and defecation, which are managed through complex interplay of neuromuscular functions, through the visceral and somatic sensory innervations and thereby bringing about central and local control (Filippo La Torre et al., 2017). The rectum serves as a mechanical and physiological ‘reservoir’ function. Under normal circumstances, continence is maintained by three factors: the rectal compliance, the high-pressure zone 2cm above anal verge, and the acute angulation at the ano-rectal junction formed by puborectalis muscle. The resting pressure of anal canal is mainly contributed by the tonicity of the internal sphincter (80%),

and the external sphincter (20%) and minor contribution from the anal venous cushions (Filippo La Torre et al., 2017). The rectal filling and stretching of its wall triggers reflex inhibition of anal canal (recto-anal inhibitory reflex – RAIR), which in turn contracts external anal sphincter and relaxes internal anal sphincter (Filippo La Torre et al., 2017). Within the rectum, the sensory perception of the rectal mucosa can discriminate whether the contents of the rectum is feces or gas. If the social circumstances prevent defecation, then the person can voluntarily postpone defecation by contracting the external sphincter and the puborectalis sling (Filippo La Torre et al., 2017). If the situation permits defecation, the person can voluntarily decide to defecate. During the act of defecation, there is voluntary inhibition of the external anal sphincter and relaxation of the puborectalis muscle; thereby the fecal matter is pushed out of the intestine with the aid of the abdominal muscles (Filippo La Torre et al., 2017). Therefore, the voluntary mechanism is indispensable for defecation to occur (Filippo La Torre et al., 2017).

Colonic Motility: The large intestine is associated with three major motility patterns, as follows (*Large Intestinal Motility*, 2022):

- *Segmental contractions:* these mix the colonic contents and tend to form the intestinal sacculations and haustra.
- *Antiperistaltic contractions:* these tend to move towards the ileum, and serve to reduce the movement of the colonic contents, and thereby facilitation additional absorption of electrolytes and water from the lumen.
- *Mass movements:* also known as 'giant migrating contractions' are intense and prolonged peristaltic contractions which often clears the intestinal contents.

The colon remains in a dormant state between the meals. On taking the meals, the enteric nervous system propagates signals in the form of gastrocolic and duodenocolic reflexes, which significantly increases the colonic motility (*Large Intestinal Motility*, 2022). The defecation reflex, stimulated by the rectal distension, is primarily a spinal reflex controlled by the pelvic nerves; this results in the reflex relaxation of internal anal sphincter, followed by voluntary relaxation of external sphincter and defecation (*Large Intestinal Motility*, 2022).

It can be emphasized that the internal sphincter relaxes when the rectum contracts, allowing the fecal matter to come into the anal canal. If the person is busy in school or other business, the external sphincter contracts immediately to avoid passing the stools. The internal sphincter is supplied by the parasympathetic nerves, but the external sphincter is supplied by somatic nerves.

Anorectal changes during pregnancy:

Uncomplicated pregnancies are commonly associated with functional changes of the gastrointestinal tract. The various clinical manifestations include: vomiting, nausea, heartburn, abdominal bloating, constipation, diarrhea, anal fissures, hemorrhoids, irritable bowel syndrome, and fecal incontinence. Hormonal factors play an important role in influencing the intestinal peristalsis and the muscles of the floor of pelvis during the 1st and 2nd trimester; whereas the mechanical alterations play a role as the gestation advances (Filippo La Torre et al., 2017).

It is estimated that about 40% of women suffer from constipation at some stage of their pregnancy (Filippo La Torre et al., 2017). There seems to be multifactorial causes depending on the hormonal influences, placental and fetal development, decreased physical activity and dietary changes. Increased progesterone can lead to intestinal smooth muscle relaxation leading to hypomotility of the small and large bowel during pregnancy (Filippo La Torre et al., 2017). Regarding the etiology of hemorrhoids during pregnancy, there are various protagonists, such as: the gravid uterus raising the pressure on the superior rectal veins; vascular effects of the progesterone; and the increased circulating volume (Filippo La Torre et al., 2017).

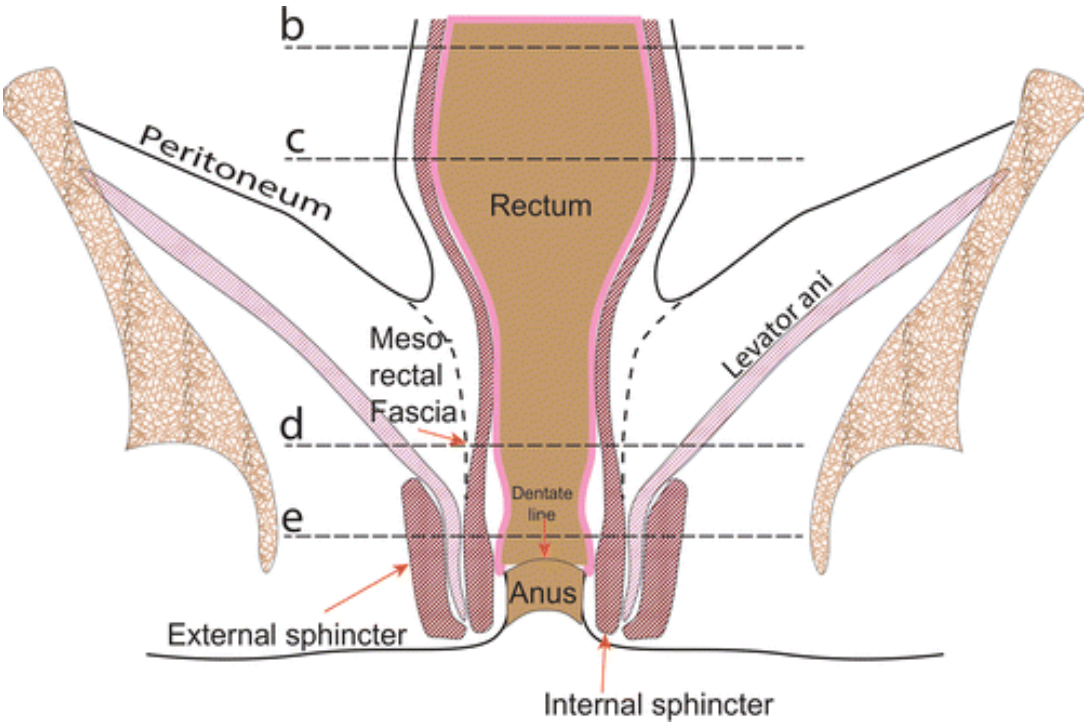


Figure 1a: *Anatomy of the anorectal region*

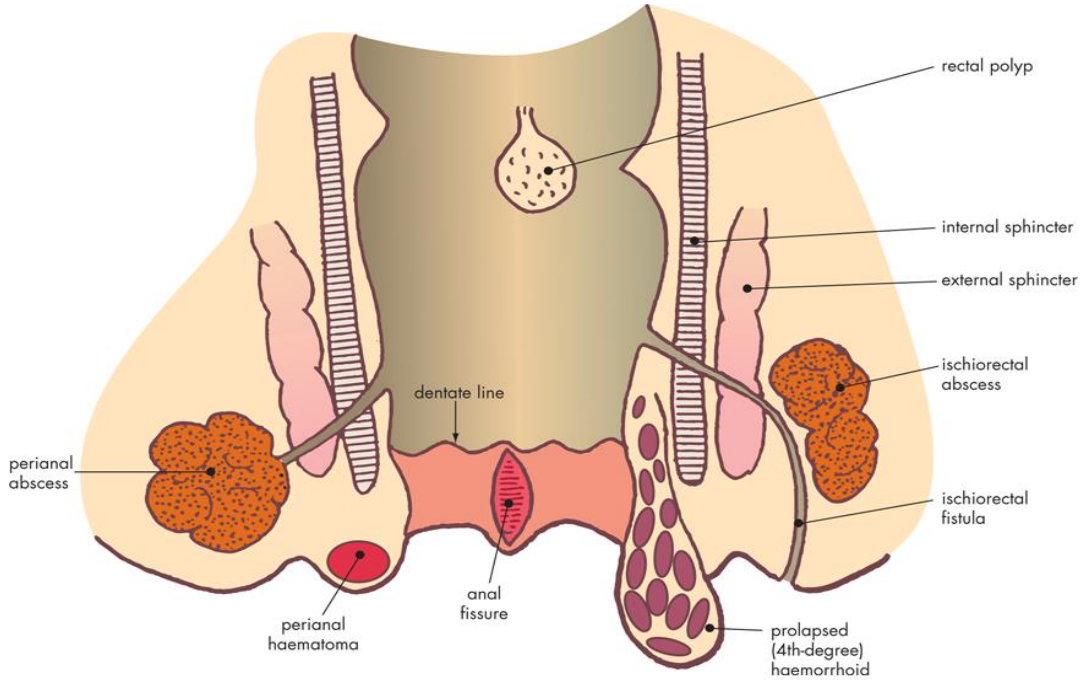


Figure 1b: *Graphical representations of various anorectal disorders*

Anal Fissures:

Anal fissure (also known as "fissure-in-ano") is a tear/crack in the anoderm distal to the dentate line, which can be acute or chronic. The linear tear occurs distal to the dentate line in the sensitive squamous epithelium of the anal canal; therefore it is characterized by pain. The fissure can extend between the dentate line proximally and the anal verge distally; it is commonly located at posterior midline (6 O' clock position) or anterior midline (12 O' clock position) (Varadarajan et al., 2018). Acute fissures are those with duration of less than 3-6 weeks; these heal spontaneously on local conservative management. Chronic anal fissures present with a longer duration (>6 weeks) and are often associated with poor blood flow and scarring; surgical interventions are often required in such cases because of failure of conservative management. Anal fissure affects both males and females equally, and may occur in all age groups (Varadarajan et al., 2018; NHS Choices, 2022). However, anal fissures are more likely to occur in children and young adults between the age group of 15 to 40 years (NHS Choices, 2022). The lifetime incidence of anal fissures has been estimated to be about 11% (Newman & Collie, 2019) and the prevalence of anal fissure in the Indian population with anorectal symptoms has been reported to be about 18% (Chaudhary & Chirag Shanti Dausage, 2019). Anal fissures are rare in the elderly people due to muscular atony. An article review reports that anal fissures account for about 14-36% of anorectal disorders with a lifetime risk of 11% (Irkal & Basava, 2019). NHS reports that anal fissure is a common condition affecting around 1 in every 10 people at some point of their life (NHS Choices, 2022). Anal fissures have a negative impact on the quality of life of the patient, and also associated with a substantial financial burden to the patient (Chaudhary & Chirag Shanti Dausage, 2019). The commonest location for anal fissures is the posterior midline; however anterior midline locations can be noted in 8% men and 25% women (Foxx-Orenstein et al., 2014). The clinician must be cautious in case of lateral anal fissures and consider etiologies like HIV, tuberculosis, malignancy, or Crohn's disease (Oh et al., 1995; Dykes et al, 2007).

Patients commonly present with severe agonizing pain during and after defecation, which may be associated with minimal bleeding per rectum. The pain is often described as

sharp, cutting, tearing, or like knife-stabbing and may last up to 1-2 hours after defecation (Newman & Collie, 2019). Hematochezia (passage of fresh bright red blood per rectum) is usually of low-volume in anal fissures. A streak of fresh blood may be passed along with the stools or noticed on the toilet paper. While the acute anal fissure appears as a fresh laceration in anus, the chronic anal fissure is often apparent with skin tags at the distal end of fissure, known as 'sentinel piles' (Foxx-Orenstein et al., 2014). The chronic fissure is palpable as a rough, fibrotic raised patch during digital examination. A hypertrophic anal papilla can sometimes be palpable at the proximal end of the anal fissure. Sometimes when the clinical diagnosis is uncertain, the patient may be subjected to Examination Under Anesthesia (EUA) to ascertain the diagnosis (NHS Choices, 2022). Chronic anal fissures are clinically associated with fibrotic base, indurated margins, exposed fibers of internal anal sphincter, hypertrophic anal papilla, and sentinel piles (skin tags) (Irkal & Basava, 2019).

Although fissures are commonly caused due to constipation, there are various other possible causes which include: persistent diarrhea, inflammatory bowel disease (IBD) – Crohn's disease & ulcerative colitis, pregnancy & childbirth, sexually transmitted infections (STIs) – syphilis & herpes, and local trauma (NHS Choices, 2022). Sometimes the exact cause cannot be identified (NHS Choices, 2022). The pathogenesis of anal fissures includes mechanisms of trauma, ischemia and increased anal pressure. The posterior region has relatively less vascularity compared to other areas of anal canal, which contributes to decreased healing ability (Schouten et al., 1994). The typical pathogenetic feature in anal fissures is increased anal canal pressure, which could be due to increased tonicity of the internal sphincter and the muscular spasm underneath the fissure occurring as a reflex to the pain from initial trauma (Foxx-Orenstein et al., 2014; Keck et al., 1995). The acute injury to anoderm causes local pain and sphincterospasm resulting in high resting anal pressure; this causes decreased blood flow and ischemia leading to further delay in fissure healing. This vicious cycle is responsible for persistence of fissures (Paul Ekka et al., 2020). Measurements of anal sphincter pressure by anal manometry may be occasionally done in case of fissures that have failed to respond to simple treatments (NHS Choices, 2022).

While acute anal fissures may heal spontaneously within a few weeks, chronic anal fissures do not heal spontaneously and require some intervention (Varadarajan et al., 2018). Anal fissures can be managed medically, or in refractory cases, surgically. Acute fissures can be managed conservatively. The non-operative therapy for anal fissure consists of 3 components (Shashidharan & Beaty, 2016):

- Treating the underlying etiopathology, i.e. alleviation of straining and constipation
- Relaxing the internal anal sphincter spasm with various therapies, which thereby improves blood flow and promotes healing
- Treating the symptoms of anal fissure, including the pain and bleeding.

The American Society of Colon and Rectal Surgeons (ASCRS) have recommended the following guidelines for the management of anal fissure (Al-thoubaity, 2020):

- Initial non-surgical management of anal fissure consists of high-fiber diet, stool softeners, and warm sitz baths.
- Other treatment strategies include the pharmacological agents, such as calcium channel blockers, glyceryl trinitrate, and botulinum toxin injection.

Since constipation is the primary reason for occurrence of fissures, the NHS recommends some simple self-help measures to avoid constipation, as follows (NHS Choices, 2022):

- Intake of high-fiber diet, such as fruits & vegetables, whole-meal bread, pasta and rice; the recommended fiber intake for adults is atleast 30g/day.
- Drinking plenty of water helps in adequate hydration and avoid dehydration
- One should not ignore the urge for defecation as this can dry out the stools and make them harder to pass
- Regular exercise is recommended aiming to perform atleast 150 minutes of physical activity every week. Daily walking or running is often adequate.
- Toilet habits must be improved. One must work out a place and time of day for comfortable and convenient toileting. If one uses toilet paper, they may avoid products containing alcohol or fragrance, as it may cause itching/discomfort.

- Sitz bath in the form of soaking the bottom in a warm bath can be carried out several times a day, particularly after passing the stools; this has a soothing effect and also relaxes the muscles in the anal region.

The medical treatment aims to relax the anal sphincter and cease the pathological cycle of pain-spasm-pain; thereby promoting enhanced vascularity to the area and fissure healing (Foxx-Orenstein et al., 2014). In order to minimize further trauma to anal canal, softening of stools and regulation of bowel habits is included in the therapy. Adults are usually given bulk-forming laxatives which help the stools to retain the fluid and make it soft and easily passable; whereas children are usually given osmotic laxatives which help in increasing amount of fluid in bowel and stimulate the passage of stools (NHS Choices, 2022). Analgesics (such as ibuprofen or paracetamol) may be given for symptomatic relief of pain (NHS Choices, 2022). Topical therapy is usually applied twice daily for atleast 6 to 8 weeks, and the pain reduction usually occurs within the first 2 weeks of therapy. Topical therapies available for anal fissures are topical nitroglycerine ointment, topical lidocaine, topical diltiazem, and topical nifedipine creams (Foxx-Orenstein et al., 2014). Although studies have demonstrated fissure healing with topical nitroglycerine, it can cause transient headaches which urge the patients to discontinue this medication (Lund & Scholefield, 1997; Thornton et al., 2005). Several studies have shown mixed results when comparing the efficacy of topical nitroglycerine with topical calcium channel blockers (i.e. CCBs like nifedipine/diltiazem) (Ezri & Susmallian, 2003; Sanei et al., 2009; Cevik et al., 2012). Topical lidocaine can cause fast reduction in the mean anal resting pressure, and also significantly improves the pain (Perrotti et al., 2002). Topical calcium channel blockers (CCBs) are the recommended first-line medical treatment options for chronic fissure-in-ano (Rasha Kadim Albayati et al., 2019). Topical CCBs reduce the anal resting pressure, by causing relaxation of the internal anal sphincter, as the sphincter tone is maintained by the calcium transport through the L-type calcium channels (Katsinelos, 2006). Studies have shown that lidocaine monotherapy has a drawback of suboptimal efficacy in symptom-control, whereas diltiazem monotherapy has a drawback of adverse reactions like headache and perianal dermatitis (Paul Ekka et al., 2020). This justifies the use of combination therapy of nifedipine with lidocaine for better efficacy in pain relief, bleeding control and faster

healing (Paul Ekka et al., 2020). Nifedipine is a better tolerable CCB which has lower incidence of adverse reactions; moreover, combination of nifedipine and diltiazem has shown significantly better results with regard to pain relief, bleeding control, and healing in chronic anal fissure, compared to lidocaine monotherapy (Paul Ekka et al., 2020). This combination of topical treatment has yielded a healing response rate of 85% in treatment of acute and chronic fissure-in-ano (Rasha Kadim Albayati et al., 2019). Furthermore, the use of topical therapy (nifedipine + lidocaine) in the setting of acute anal fissures can prevent the progression into chronic anal fissure (Rasha Kadim Albayati et al., 2019). Botulinum toxin (BTX) injection into the internal anal sphincter is an effective non-surgical therapy for anal fissures. Studies have shown healing rates of 83 to 92% by injecting about thirty units of BTX into the internal sphincter (Foxx-Orenstein et al., 2014). Furthermore, botulinum toxin injection has shown better results than topical nitroglycerine (Brisinda et al., 2007; Sileri et al., 2010). The effects of botulinum toxin injections often last for about 2-3 months, which allows adequate time for the fissure healing (NHS Choices, 2022). Patients on medical management may require follow-up visits to monitor the symptom relief and fissure healing. If there is no response to treatment after 8 weeks, then surgical treatment may be considered by a specialist (NHS Choices, 2022).

Anal dilatation was first described and popularized by Lord's in 1838, for the treatment of hemorrhoids (McCallion & Gardiner, 2001). Historically, the original Lord's procedure involved anal dilatation using 8 fingers, but it was eventually abandoned in favor of a gentler four-finger anal dilatation (McCallion & Gardiner, 2001). This modified Lord's anal dilatation procedure involves manual stretching of anal sphincter, under general anesthesia. It is the most favorable, simple and accepted methods for the treatment of anal fissures; it can also serve as an adjunctive procedure in the early stages of piles (*Lord's stretch - General Practice Notebook*, 2018). It causes fissure healing by releasing the sphincterospasm and reducing the anal canal pressure and thereby improving the blood flow. Fresh bleeding within the fissure also aids in its healing. The lowering of intra-anal pressure also helps during defecation as it helps in the easier passage of stools and reduces the discomfort during defecation. As there is a reduction in straining, the vascular congestion of anal cushions also decreases (*Lord's stretch - General Practice Notebook*, 2018). Fecal or

flatus incontinence is seldom seen in experienced hands (Gupta, 2004). However, if this procedure is performed in an uncontrolled manner, it may cause permanent fecal incontinence, especially in the elderly patients (*Lord's stretch - General Practice Notebook*, 2018). Lord's procedure or manual anal dilatation has been used over the past decades, and some case series have reported very good results through a 5-year follow-up (Aljabery, 2020).

Lateral internal sphincterotomy (LIS) is the gold standard surgical treatment for chronic refractory anal fissures; it has shown to be effective with a low rate of recurrence (<10%) (Foxx-Orenstein et al., 2014). LIS involves dividing the lower muscle fibers of internal anal sphincter so as to relieve the anal canal pressure; this procedure can be done under local/spinal anesthesia or sedation and involves open and closed approaches (Lu & Lin, 2021). LIS has been shown to be among the most effective treatments for anal fissures which can cause fissure healing within 2-4 weeks (Lu & Lin, 2021). However, temporary bowel incontinence is the main problem associated with the LIS. A review from Cochrane database reports that surgical treatment is more effective than medical treatment for resistant anal fissures (Foxx-Orenstein et al., 2014); however, sphincterotomy is associated with a well-known complication of fecal incontinence (FI), whereas medical management has no such associations with FI (Nelson et al., 2012; Nyam & Pemberton, 1999). It is recommended to start treatment with medical management first and reserve surgery in medically refractory cases because surgery (sphincterotomy) requires inpatient care, anesthesia, increased costs, and higher morbidity (Foxx-Orenstein et al., 2014). It is emphasized that inappropriately or inadequately treated anal fissures may lead to infection, abscesses, or recurrence; and sometimes even fecal impaction as patients tend to avoid defecation due to fear of pain (Newman & Collie, 2019). Eisenhammer, in 1951, found out that the internal anal sphincter contracture was a surgically correctable cause for chronic anal fissure syndrome (EISENHAMMER S, 2019). Eisenhammer further advocated that atleast four-fifths of the internal anal sphincter must be divided during lateral anal sphincterotomy (EISENHAMMER S, 2019). "Tailored sphincterotomy" is a modification wherein there is a lesser degree of sphincter division, only upto the apex of the fissure; this happens to reduce the fecal incontinence rates (Steele, 2021).

In an article review, medical and surgical treatments in chronic anal fissure were comparatively studied (Irkal & Basava, 2019). This review reported that medical treatment showed complete pain relief in 64%-92.5%, while surgical treatment showed 96%-100% pain relief; medical treatment showed fissure healing rates of 72%-92.5%, while surgical treatment showed fissure healing rates of 93%-100% (Irkal & Basava, 2019). It concluded that surgical treatment had significantly better pain relief and fissure healing rates compared to medical treatment for chronic anal fissures (Irkal & Basava, 2019). Among the surgical treatments, lateral internal sphincterotomy showed to be most efficacious with the highest healing and lowest failure rates; however, it was associated with the self-subsiding complications such as perianal hematoma and incontinence (9%) (Irkal & Basava, 2019).

Numerous studies have been conducted for the comparison between Anal Dilatation (AD) and Lateral Anal Sphincterotomy (LAS) in the treatment of chronic anal fissures. A prospective randomized controlled trial (RCT) reported that AD and LAS had similar post-operative symptoms, complications, and recurrence rates; it was concluded that AD was a suitable option for chronic anal fissure treatment being less invasive compared to LAS, and with equivalent efficacy and safety (Dr. Arunkumar Uttam & Dr. Pramoda Sangolagi, 2018). An observational study suggested that both AD and LAS comparatively provided early pain relief and high fissure healing rate; however it concluded that LAS was a safer option with relatively lower recurrence and incontinence rates (Rakesh Kumar Pandit & Vinay Kumar Jha, 2019). A prospective study considered maximal anal dilatation with fissurectomy for treating chronic anal fissures; it suggested that this treatment was a radical form of anal dilatation associated with poorer outcomes (Fernando, 2017). A controlled prospective trial reported slightly better symptomatic relief with AD compared to LAS, and that AD was not associated with any complications such as incontinence or sphincter injuries (Agarwal et al., 2015). With reference to the aforementioned studies, one may conclude that both anal dilatation and lateral anal sphincterotomy are effective surgical treatments for chronic anal fissures in case of failure of conservative (medical) managements. These procedures can be performed under spinal or general anesthesia with a short hospital stay. Both these procedures have shown early pain relief, high fissure healing

rates, and overall symptomatic improvements with an equivalent efficacy and safety profile. Both procedures have shown high cure rates of over 90%. There are no instances of major sphincter injury and incontinence with these procedures; both have a comparable post-operative symptoms, complications and recurrence rates. Although anal dilatation is less invasive, there have been differences in the consistency of technique employed. Literature review shows the difference between the original Lord's procedure and the controlled manual anal dilatation which we have employed in our practice. Studies have shown that the original Lord's procedure involved uncontrolled and forceful stretching of the anal sphincter using upto 8 fingers (well-lubricated), and it was associated with a significant complication of anal incontinence (upto 18%). Hence this procedure was outdated. However, we practice the modified method of "controlled manual anal dilatation" or "Modified Lord's Anal Dilatation", using 4 fingers; this modified procedure has negligible incontinence rates and improved patient outcomes and overall satisfaction. We have been practicing this modified Lord's anal dilatation in our setting, performed under short general anesthesia using anesthetic agents like propofol, ketamine, pentazocine (fortwin), and Pentothal (thiosol). Furthermore, modified Lord's anal dilatation has been shown to be effective in treating fissure-in-ano, as well as hemorrhoids (Grade I & II). Our study has made substantial evidence-based contribution supporting the utilization of anal dilatation procedure. It has shown significantly favorable results. Anal dilatation having an advantage of being less invasive, can potentially replace lateral anal sphincterotomy as a 'gold standard' technique in CAF. The term "Anal Sphincter Tone Optimization (ASTO)" has been used for modified Lord's controlled anal dilatation. Treatment of chronic anal fissure with anal dilatation primarily aims to reduce both the external and internal anal sphincter tone and thereby facilitate fissure healing. The sentinel piles, skin tags, papillomas, thrombotic external piles can be excised in the same setting of anal dilatation. Fecal impaction can also be treated by anal dilatation with manual fecal evacuation under short GA; increased laxative doses and proctoclysis (enema) may be required whenever necessary.

Various other interventions for anal fissures have been noted in the literature which includes chemical/electrical cauterization, fissurectomy with/without skin grafting, anal advancement flaps, cryotherapy, carbon dioxide laser therapy, radiofrequency surgery, etc.

However, their roles have not been established in routine practice because of their inherent pros and cons (Gupta, 2004).

Hemorrhoids:

Hemorrhoids (commonly termed as "piles") refer to the abnormally enlarged submucous venous cushions located in the lower rectum and anal canal. It is an extremely common anorectal disorder, and it has been reported that about 50% of the population would have hemorrhoids at some point of time before reaching the age of 50 years. It is estimated that about 5% of the population suffers from hemorrhoids at any given time (Agarwal et al., 2017). It tends to occur in both the sexes with the peak prevalence between the ages of 45 to 65 years (Lohsiriwat, 2012). Internal hemorrhoids are those located above the dentate line and arise from the superior hemorrhoidal plexus; due to visceral innervations by overlying rectal mucosa, they are painless. External hemorrhoids are those located below the dentate line and arise from the inferior hemorrhoidal plexus; due to somatic innervations with numerous pain receptors and overlying squamous epithelium, this may be painful. Interno-external (or mixed) hemorrhoids arise from both above and below the dentate line (Lohsiriwat, 2012). Internal hemorrhoids are graded according to Goligher's classification, as follows (Lohsiriwat, 2012):

- Grade 1 (First-degree): bulges into lumen but stays proximal to the dentate line.
- Grade 2 (Second-degree): bulges and protrudes through the anus on straining and reduces spontaneously.
- Grade 3 (Third-degree): bulges and protrudes through the anus on straining and requires pushing and manual repositioning (Foxx-Orenstein et al., 2014).
- Grade 4 (Fourth-degree): prolapsed hemorrhoids unable to reduce and may get strangulated (Foxx-Orenstein et al., 2014). Fourth-degree hemorrhoids also include acutely thrombosed & incarcerated hemorrhoids, with/without circumferential mucosal prolapse.

Hemorrhoids could result due to weakening of supportive connective tissue around the venous plexus as well as congestion and distension of hemorrhoidal plexus (Foxx-Orenstein et al., 2014). This occurs because of factors which raise intra-abdominal pressure like constipation, straining, pregnancy and prolonged sitting (Foxx-Orenstein et al., 2014; Feldman et al., 2020). Furthermore, obesity and family history of hemorrhoids can also contribute as etiological factors (*Hemorrhoids*, 2022). Some studies have reported diarrhea as a risk factor for hemorrhoid development (Lohsiriwat, 2012). Pregnancy is known to predispose to the congestion of anal venous plexuses and piles, which tends to normalize following childbirth (Lohsiriwat, 2012). There has been inconsistent evidence about the causative implication of the dietary factors like low fiber diet, alcohol intake, and spicy foods (Lohsiriwat, 2012).

Hemorrhoids commonly present with symptoms such as, painless bleeding per rectum (often projectile), protrusion of mass per anus, pruritus (itching), perianal irritation, mucus discharge or fecal soilage (Foxx-Orenstein et al., 2014). Some patients have reported a sense of rectal fullness and incomplete evacuation, in case of large hemorrhoids (Lohsiriwat, 2012). In the presence of anorectal pain, a careful history must be elicited regarding the nature of pain and its relationship to defecation, which often provides a diagnostic clue (Pfenninger & Zainea, 2001). Internal hemorrhoids may sometimes be associated with aching type of pain after a bowel movement (Pfenninger & Zainea, 2001). This pain can be differentiated with that of anal fissures; where there is a sharp pain with maximum intensity during defecation, and which continues for some time after defecation (Pfenninger & Zainea, 2001). Complicated hemorrhoids may be painful. Hemorrhoids are usually related with complications such as strangulation and anemia; strangulation occurs when the vascularity of the prolapsed hemorrhoidal tissue gets compromised leading to gangrene, and anemia occurs due to chronic blood loss in long-term hemorrhoids (*Hemorrhoids*, 2022). Bleeding from hemorrhoids often occurs as bright-red colored fresh blood dripping into the toilet bowl (Foxx-Orenstein et al., 2014); substantial blood loss can also lead to iron-deficiency anemia. Thrombosed external hemorrhoids can present with pain without bleeding (Foxx-Orenstein et al., 2014). Hemorrhoids can be diagnosed by physical examination (inspection), digital rectal examination (DRE), anoscopy, proctoscopy,

sigmoidoscopy, and colonoscopy (*Hemorrhoids*, 2022). Hemorrhoids can also be classified based on the anatomical positions, as primary (occurring at 3 typical sites of anal cushions – see figure 2), secondary (occurring in between the typical sites), and circumferential hemorrhoids (Lohsiriwat, 2012). They can also be classified as prolapsing and non-prolapsing hemorrhoids (Lohsiriwat, 2012).

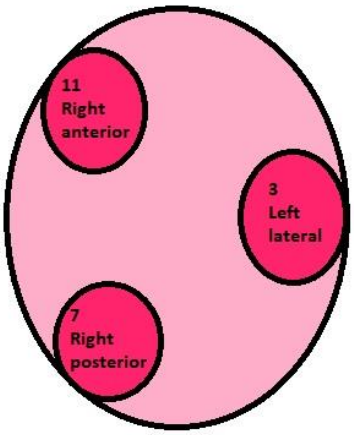


Figure 2: *Diagram showing the common sites for primary internal hemorrhoids, corresponding to the sites of the three major anal cushions at 3, 7, and 11 O' clock positions.*

Hemorrhoids can be managed by operative or nonoperative treatments. In case of acutely thrombosed external hemorrhoids, analgesics and sitz bath may be sufficient; however surgical excision of the thrombus can be done which is shown to be more effective during the initial 48 to 72 hours of presentation (Greenspon et al., 2004).

All the symptomatic hemorrhoids patients must be advocated to avoid constipation and straining at stools. Fiber supplementation, adequate fluid intake, and a mild laxative can aid in stool bulking and reduce straining (Rivadeneira et al., 2011). Those with constipation as a significant factor can be managed by judicious usage of laxatives such as lactulose, PEG, and stool-bulking medications (Agarwal et al., 2017). Thus, dietary and lifestyle modifications are recommended as the first-line treatment in hemorrhoids. Consumption of high-fiber diet (fruits, vegetables, & wholegrains) and over-the-counter fiber supplements

helps to maintain the stools soft, formed and bulky; the recommended dose is 25-35 grams fiber per day (*Hemorrhoids | ASCRS*, 2022). Clinical studies have shown that fiber supplementation causes a symptomatic reduction in bleeding upto 50%, although there is no improvement in symptoms like pain, prolapsed, and itching (Alonso-Coello et al., 2006; Lohsiriwat, 2012). It is therefore implied that fiber supplement is effective treatment in case of non-prolapsing hemorrhoids; however, the significant improvement can manifest after a prolonged period of up to 6 weeks of treatment (Lohsiriwat, 2012). Fiber supplements being cheap and safe can be a default inclusion in the management of hemorrhoids (Lohsiriwat, 2012). Lifestyle modification is advisable in the treatment as well as prevention for any degree of hemorrhoids (Lohsiriwat, 2012). The recommended lifestyle modifications include: increased intake of oral fluids and dietary fiber, decreased consumption of fat, improvement of anal hygiene, regular exercises, avoiding straining while defecation, and stopping the medications which cause constipation or diarrhea (Lohsiriwat, 2012). Furthermore, spending longer time on the toilet has been an associated etiological factor, hence it has been recommended to shorten the time on the toilet to prevent hemorrhoids (*Hemorrhoids | ASCRS*, 2022).

Medical treatment for hemorrhoids includes oral flavonoids, oral calcium dobesilate, and topical treatments (Lohsiriwat, 2012). Oral flavonoids are the venotonic agents originally described for the treatment of chronic venous insufficiency and edema (Lohsiriwat, 2012). Micronized purified flavonoid fraction (MPFF) is the commonest flavonoid used in treating hemorrhoids; it is the recommended medical management for grade 1, 2, and 3 hemorrhoids (Lohsiriwat, 2012). Micronization helps in improved solubility and absorption of the drug, and also shortens the onset of action (Lohsiriwat, 2012). MPFF is helpful in acute bleeding hemorrhoids, and also serves as a supportive treatment to surgical techniques (Agarwal et al., 2017). Some studies have reported that MPPF reduces the rectal pain, discomfort, and secondary hemorrhage following hemorrhoidectomy (La Torre & Nicolai, 2004; Lohsiriwat, 2012). Meta-analyses have shown that flavonoids in hemorrhoid treatment decreased the risk of bleeding by 67%, persistent pain by 65%, and itching by 35%; it also reduced the recurrence rate by 47% (Alonso-Coello et al., 2006; Lohsiriwat, 2012). Oral calcium dobesilate has also been used to treat acute symptoms of hemorrhoids (Misra & Imlitemsu,

2005). Calcium dobesilate has been demonstrated to decrease capillary permeability, inhibit platelet aggregation, improve blood viscosity, and thereby reduce the tissue edema (Tejerina & Ruiz, 1998). Combination of calcium dobesilate with fiber supplementation in hemorrhoids has shown to effectively relieve acute bleeding and significantly improve the inflammation within the hemorrhoids (Menteş et al., 2001). Topical therapies mainly aim to relieve the symptoms, rather than cure the disease. These topical therapies are available in the form of creams and suppositories, containing ingredients like corticosteroids, local anesthetic, antibiotics and anti-inflammatory drugs (Lohsiriwat, 2012). The topical therapies target the internal anal sphincter tone, and can also cause vasoconstriction of the hemorrhoidal vascular channels (Lohsiriwat, 2012).

Internal hemorrhoids are managed based on the degree of disease (grades). Typically, non-operative treatment can be applied for grades 1, 2, and 3. Surgical treatment can be given to those whose symptoms fail to respond to non-operative therapies or those with grade 4 hemorrhoids. Certain office procedures have been established for treating hemorrhoids; their goal is to reduce the redundant hemorrhoidal mass, promote its fixity to the rectal wall, as well as reduce the vascularity (Foxx-Orenstein et al., 2014; Rivadeneira et al., 2011). Such office procedures include: rubber band ligation (most commonly performed procedure), sclerotherapy, and infrared coagulation. Meta-analysis has proved rubber band ligation to be superior to infrared coagulation and sclerotherapy; the former has minimal complication and recurrence rates (MacRae & McLeod, 1995). Rubber band ligation (RBL) is mainly performed in first to third-degree hemorrhoids (Lohsiriwat, 2012). In rubber band ligation, a band is tied at the hemorrhoidal base inside the rectum with an intention to cut-off its vascular supply; the hemorrhoidal tissue thereby shrinks away in few days (*Hemorrhoids*, 2022). However, if the ligation is below the dentate line, it may be very painful and demands quick removal of ligature (Lohsiriwat, 2012). RBL has been associated with some common complications (Lohsiriwat, 2012). Sclerotherapy is a recommended choice for grade I & II hemorrhoids, wherein the sclerosing chemicals like 5% phenol in oil, quinine, vegetable oil, urea hydrochloride and hypertonic salt solution are used (Lohsiriwat, 2012). In sclerotherapy, a chemical (sclerosant) is injected in the submucous plane around the hemorrhoidal vessels which then shrinks the hemorrhoidal tissue eventually (*Hemorrhoids*,

2022). The rationale for injection sclerotherapy is causing mucosal fixation to the underlying muscles by fibrosis (Lohsiriwat, 2012). However, one must be cautious to inject the sclerosant in the submucosa at the base of the hemorrhoidal mass, and that improper injection can cause complications, such as transient precordial/upper abdominal pain, bleeding and infective complications (Lohsiriwat, 2012). In infrared photocoagulation or electrocoagulation, the hemorrhoidal tissue is coagulated using special devices which utilizes infrared or electrical energy (*Hemorrhoids*, 2022). However infrared coagulation can be used only in small hemorrhoids (Lohsiriwat, 2012). Radiofrequency ablation (RFA) is a newer option wherein the vascular component of hemorrhoidal tissue is reduced and the hemorrhoidal mass gets fixed to the underlying tissue due to fibrosis (Lohsiriwat, 2012). RFA is a virtually painless procedure which can be performed on an outpatient basis. However, it may lead to persistence of symptoms, and can be associated with complications like urinary retention, perianal thrombosis, and wound infection (Lohsiriwat, 2012). Cryotherapy is another painless treatment option for hemorrhoids, which is rarely used because of its inherent drawbacks (Lohsiriwat, 2012). Meta-analyses have compared the non-operative treatments for hemorrhoids, and showed that RBL has fewest symptom recurrence and lowest rates of retreatment (Lohsiriwat, 2012). Hemorrhoidectomy and hemorrhoidopexy are the common operative procedures to remove the hemorrhoids permanently (*Hemorrhoids*, 2022).

There are various philosophical theories regarding the pathogenesis of hemorrhoids, and their relevant surgical approaches (Lohsiriwat, 2012) as described in the table 1.

Table 1: *Philosophical theories regarding pathogenesis of hemorrhoids and their relevant surgical approaches* (Lohsiriwat, 2012)*:*

Theory	Brief description	Surgical approach
Sliding anal cushions	When the supporting tissues of anal cushions disintegrate/deteriorate, it leads to development of hemorrhoids.	Hemorrhoidectomy; Plication
Rectal redundancy	There is an internal rectal prolapse associated with the hemorrhoidal prolapse.	Stapler hemorrhoidopexy
Vascular abnormality	Hemorrhoids result due to the hyperperfusion of the arteriovenous plexus within the anal cushions.	Doppler-guided hemorrhoidal artery ligation

Excisional hemorrhoidectomy and stapled hemorrhoidopexy are the two common surgical procedures employed in the surgical management of hemorrhoids (grades 3 and 4); the latter has shown to have reduced post-operative pain but higher recurrence compared to the former (Foxx-Orenstein et al., 2014). Open hemorrhoidectomy is also known as "Milligan-Morgan technique", while Closed hemorrhoidectomy is also known as "Ferguson's technique"; both open and closed hemorrhoidectomy are considered as gold standard surgeries for hemorrhoids (Khanna et al., 2010). Excisional hemorrhoidectomy has shown minimum recurrence and maximum efficacy among the surgical treatments for hemorrhoids, (MacRae & McLeod, 1995; Lohsiriwat, 2012). Excisional hemorrhoidectomy can be performed using scissors, diathermy, or any vascular-sealing device (like Ligasure and Harmonic scalpel) (Lohsiriwat, 2012). Excisional hemorrhoidectomy can be safely performed as an ambulatory surgery, under perianal anesthetic infiltration (Lohsiriwat, 2012). However, postoperative pain is the main drawback of hemorrhoidectomy (Lohsiriwat D; Lohsiriwat V, 2021). Also, there are other associated complications of hemorrhoidectomy, such as, post-operative bleeding (0.03 – 6%), acute urinary retention (2 – 36%), bacteremia & infections, wound problems, mucosal prolapse, sensory loss over

anus, anal stricture, and fecal incontinence (Lohsiriwat, 2012). According to the latest evidence, hemorrhoidal specimen may be exempted from the histopathological examination if there is no suspicion of malignancy (Lohsiriwat et al., 2009). Plication is a procedure wherein the hemorrhoidal mass is oversewn, and a knot is tied at the uppermost vascular pedicle, thereby restoring the anal cushions to their normal positions without excision; however it has certain complications such as pelvic pain and bleeding (Lohsiriwat, 2012; Acheson & Scholefield, 2008). Doppler-guided hemorrhoidal artery ligation (DGHAL) is a newer modality which uses the Doppler to ligate the terminal branches of superior hemorrhoidal artery (Lohsiriwat, 2012). The rationale for this treatment is based on the demonstration of increased caliber and arterial blood flow in the terminal branches of superior hemorrhoidal artery, as observed in hemorrhoid patients (Lohsiriwat, 2012). It has been effective in treating second and third-degree hemorrhoids and the short-term outcomes are comparable to conventional hemorrhoidectomy; however the long-term outcomes are unpredictable (Lohsiriwat, 2012; Faucheron & Gangner, 2008). Stapled hemorrhoidopexy is also known as MIPH (Minimally Invasive Procedure for Hemorrhoids) and PPH (Procedure for Prolapse and Hemorrhoids); this procedure involves circumferential cutting of redundant rectal mucosa along with the internal hemorrhoids and fixing the mucosa within the anal canal by using a specialized device. This procedure not only lifts the prolapsing hemorrhoids, but also interrupts the blood supply to the hemorrhoidal mass (Lohsiriwat, 2012). Although it has its own advantages, there has been a consideration about the recurrence rates, cost of stapler device, and potential serious complications like rectal stricture and rectovaginal prolapse; this consideration has reserved the use of stapler hemorrhoidopexy in patients with circumferential prolapsing hemorrhoids and those having three of more lesions of advanced internal hemorrhoids (Lohsiriwat, 2012). Ligasure™ hemorrhoidectomy is another sutureless, closed hemorrhoidectomy technique which utilizes a specialized and modified electrosurgical unit for tissue and vascular sealing; this method is simple, easier, safe, and effective and has lesser blood loss, post-operative pain, and complications compared to the conventional hemorrhoidectomy techniques (Khanna et al., 2010). Doppler-guided hemorrhoidal artery ligation (DGHAL) or transanal hemorrhoidal dearterialization (THD) is another procedure recommended for treating grade 2-4

hemorrhoids (Agarwal et al., 2017). Hemorrhoidectomy can be considered in the following cases (American Gastroenterological Association, 2004; *Hemorrhoids | ASCRS*, 2022):

- Repeated thrombosis of external hemorrhoids
- Ligation has not been effective in treating internal hemorrhoids
- Failure of non-operative management
- Persistence of chronic bleeding
- Protruding hemorrhoids are unable to be reduced
- Acute strangulation of hemorrhoids
- Patient preference

Studies have made an interesting physiological observation that the patients with prolapsing/non-prolapsing hemorrhoids had a much higher resting anal pressure compared to normal subjects; however, no significant change in the thickness of the internal anal sphincter was observed (Sun et al., 1992; Lohsiriwat, 2012). These physiological changes tend to be reversed after hemorrhoidectomy, suggesting that these changes could be an effect of hemorrhoidal disease rather than a cause (Lohsiriwat, 2012).

Various comparative studies and meta-analyses have been performed regarding the treatment options for hemorrhoidal disease. According to MacRae et al, hemorrhoidectomy has higher efficiency compared to anal dilatation and rubber band ligation, but is painful and has certain complications (MacRae & McLeod, 1995); RBL showed greater efficacy compared to injection sclerotherapy for treatment of first-to-third degree hemorrhoids, without any distinction in the occurrence of complications; Injection sclerotherapy and infrared coagulation were likely to require further treatments (MacRae & McLeod, 1995; Lohsiriwat, 2012). According to Shanmugam et al, hemorrhoidectomy was superior to RBL for long-term treatment of grade III hemorrhoids, but not grade II hemorrhoids; however, the acceptance and patient satisfaction about both the modalities were similar, although hemorrhoidectomy was associated with more pain, complications, and time-off from work (Shanmugam et al., 2005; Lohsiriwat, 2012). Alonso-Coello et al emphasized the importance of oral flavonoids, and showed that flavonoids significantly reduced the symptoms and prevented them to recur (Alonso-Coello et al., 2006; Lohsiriwat, 2012). Ho et

al compared the closed and open hemorrhoidectomy techniques and concluded that they were both similar in efficiency and outcomes; although closed technique had longer operating time but faster wound healing (Ho & Buettner, 2007; Lohsiriwat, 2012). Nienhuijs et al showed advantages of Ligasure hemorrhoidectomy compared to conventional hemorrhoidectomy; they concluded that Ligasure hemorrhoidectomy had significantly short operating time, lesser post-operative pain, and faster recovery, with no difference in incontinence or recurrent bleeding (Nienhuijs & de Hingh, 2009; Lohsiriwat, 2012). Burch et al, as well as, Giordano et al, compared the stapled hemorrhoidopexy (SH) with the conventional hemorrhoidectomy; the former reported that SH had lesser post-operative pain, lesser operating duration, lesser duration of hospital stay and quicker recovery; but the latter reported significantly higher incidences of recurrence and additional treatments with SH (Burch et al., 2009; Giordano, 2009; Lohsiriwat, 2012).

Hemorrhoidectomy is often associated with significant post-operative pain and anal canal stenosis as potential complications. The internal sphincter spasm is thought to play an important role in causing post-operative pain following hemorrhoidectomy. Studies have shown that Lord's anal dilatation causes significant improvement in wound healing and decreases post-operative pain following hemorrhoidectomy (Aljabery, 2020). Furthermore, studies have also reported that the Lord's procedure significantly reduced the anal canal pressure in case of hemorrhoids associated with high anal canal pressures (Aljabery, 2020). However, there are studies which have compared hemorrhoidectomy with Lord's anal dilatation; these studies have concluded that hemorrhoidectomy is preferable and safer option in hemorrhoidal disease, with excellent long-term results compared to the anal dilatation (Konsten & Baeten, 2000). An older study has emphasized that continued anal dilatation (by using an anal dilator) is not necessary following a Lord's procedure for hemorrhoidal disease (Vellacott & Hardcastle, 1980).

Anorectal abscesses and Fistula-in-ano:

These are a spectrum of the same disease originating from the infection of the anorectal glands. A perianal abscess is a pus-filled infected cavity occurring in the anus, rectum or perianal region; while an anal fistula (fistula-in-ano) is a tunnel that tracks from an internal opening within the anal canal to an external opening over the skin around the anus (*Abscess and Fistula | ASCRS*, 2022). Initially, the infection manifests as a perianal abscess, which may be followed by a chronic suppurative process, resulting in the formation of perianal fistula. About 40-50% of perianal abscesses have been shown to get converted into fistula (Feldman et al., 2020; Abcarian, 2011). About thirty to seventy percent of anorectal abscess cases are often found to have an existing fistula-in-ano on examination (Carr & Velasco, 2021). However, a fistula-in-ano can also occur de-novo without an abscess (*Abscess and Fistula | ASCRS*, 2022). It is commonly observed in men around the age of 40 years (Sainio P, 2020; Abcarian, 2011). The infected anorectal gland suppurates and forms a perianal abscess. This infection can extend through the tissues perianally, leading to the formation of fistula-in-ano, which is nothing but the connecting tract between the infected anal crypt and the perineum (Foxx-Orenstein et al., 2014). This cryptoglandular infection and anorectal abscess is the commonest cause for the perianal fistula formation. However, other etiologies for perianal fistula include radiation proctitis, Crohn's disease, prior anal surgery, foreign body, infections (tuberculosis, HIV, or actinomycosis), and malignancy (Foxx-Orenstein et al., 2014). The risk factors for the development of fistula-in-ano include diabetes, obesity, hyperlipidemia, smoking, and a sedentary lifestyle (Carr & Velasco, 2021).

Perianal abscess often presents as a painful swelling in the perianal region that can be visible and palpable; other symptoms can be present like redness, fever, chills, and generalized weakness (*Abscess and Fistula | ASCRS*, 2022). If the abscess lies higher in the intersphincteric space (rectal or ischiorectal abscess), a tender boggy area can be palpated during the rectal examination; there might not be any appreciable visible abnormality in such cases. Typically, there is an acute onset with a short duration, along with toxic symptoms like fever and malaise (Foxx-Orenstein et al., 2014). A fistula-in-ano can have

similar symptoms, in addition to the drainage from the external opening (*Abscess and Fistula | ASCRS*, 2022). Perianal fistula can be distinguished from the anorectal abscess by the characteristic of pain; abscess has constant throbbing pain, while fistula has intermittent pain. Other symptoms of fistulae are: discharge of blood, pus, or stool from an external opening in the perianal region, and perianal itching (Foxx-Orenstein et al., 2014). Fistula-in-ano is suspected whenever the symptoms keep recurring over the same area every few weeks (*Abscess and Fistula | ASCRS*, 2022).

Anorectal abscesses and fistulas are often diagnosed and managed based on clinical features. However, imaging studies may be occasionally required, such as, ultrasound, CT scan, or MRI scan; these studies aid in the diagnosis and management of deeper abscesses, and also visualize the fistula tract/tunnel (*Abscess and Fistula | ASCRS*, 2022).

Anorectal abscesses are typically managed surgically by incision and drainage (I & D) with an intention to prevent spread, recurrence, and subsequent fistulization (Whiteford et al., 2005). This is a simple procedure of incising the perianal skin and draining the abscess, which can be done as an office-procedure under local anesthesia, or in an operation theater under general anesthesia (*Abscess and Fistula | ASCRS*, 2022). Some patients with severe disease may require multiple surgeries to control the problem (*Abscess and Fistula | ASCRS*, 2022). The ASCRS does not recommend routine use of antibiotics in treatment of anorectal abscess/fistula, unless associated with conditions like diabetes, immunocompromise, uncontrolled cellulitis, or prosthetic implants (Whiteford et al., 2005; *Abscess and Fistula | ASCRS*, 2022). An abscess can occasionally "burst" spontaneously onto the skin and start draining the pus; this is especially true if the abscess develops over an old abscess or an operated site (Molloy, 2022).

Based on the pathophysiology, anal fistulas may be classified into simple and complex anal fistulas. Simple anal fistulas tend to occur to due to glandular obstruction, followed by infection and abscess formation, which ultimately forms a fistula (Carr & Velasco, 2021). Typically, simple anal fistula has a single tract in the subcutaneous plane, and involves <30% of the external sphincter; such simple anal fistulas are easier to treat with

lowest rates of complication and recurrence (Carr & Velasco, 2021). The characteristics of complex anal fistulas include: multiple tracts, recurrent fistulas, those involving >30% of the external anal sphincter, as well as those with associated predisposing factors like Crohn's disease and radiotherapy (Carr & Velasco, 2021). Simple fistulotomy must not be performed in complex fistulas involving large extent of external sphincter, because of the risk of post-operative anal incontinence; hence complex (or staged) repair is preferable in such cases (Carr & Velasco, 2021). An underlying inflammatory bowel disease (IBD) may be possible in case of multiple fistulas or those with ongoing recurrence (Carr & Velasco, 2021).

Fistula-in-ano can be categorized on anatomical basis into intersphincteric, transsphincteric, suprasphincteric, and extrasphincteric (Park's classification of anorectal fistulas) (Carr & Velasco, 2021; *UpToDate*, 2022):

- *Intersphincteric or type 1* (45%): The fistula tract travels along the intersphincteric plane
- *Transsphincteric or type 2* (30%): The fistula penetrates the internal anal sphincter as well as external anal sphincter
- *Suprasphincteric or type 3* (20%): The fistula encompasses the entire sphincter apparatus; the tract traverses the internal anal sphincter, and then passes over the external anal sphincter along the intersphincteric plane, before descending into the perianal region. Horseshoe fistulas are included in this type.
- *Extrasphincteric or type 4* (5%): This rare type of fistula connects the rectum to the perineum extending lateral to both the anal sphincters. As the preservation of sphincter mechanism is necessary, this type poses maximum difficulty for treatment.

Magnetic resonance imaging (MRI) or transrectal/endoscopic ultrasound aids in the diagnosis of the type of fistula; MRI being the most sensitive imaging modality (Carr & Velasco, 2021). No treatment is usually needed in a case of asymptomatic Crohn's fistula. For the management purpose, fistula-in-ano may be classified into low and high fistulas. The surgical management is determined by the fistula type, with an intention of primary healing

(Siddiqui et al., 2012; Foxx-Orenstein et al., 2014). Fistulotomy and fistulectomy are the classical surgical treatment options for perianal fistulae. Fistulotomy is done in many patients where the fistula is not too deep; this procedure involves opening up of the fistula tract, so as to allow the healing from the bottom up (*Abscess and Fistula | ASCRS*, 2022). Although fistulotomy has been shown to have a high success rate (92-97%), it must be balanced with the risk of incontinence which might occur due to division of anal sphincter muscles (*Abscess and Fistula Expanded Information | ASCRS*, 2022). In some difficult cases of anal fistulas, multiple surgeries may be required (*Abscess and Fistula | ASCRS*, 2022). Proper post-surgical care is inevitable; however in spite of adequate treating and complete healing, the abscess/fistula has a tendency to recur (*Abscess and Fistula | ASCRS*, 2022). It has been reported that about 1/3rd of patients with anorectal abscesses will never get an abscess after the initial treatment; 1/3rd of cases can get recurrent abscess; and about 1/3rd to 1/2 of cases can develop a fistula (Molloy, 2022). Newer procedures like LIFT (Ligation of intersphincteric fistula tract), VAAFT (Video-assisted anal fistula treatment), fistula plugging with fibrin glue or collagen plug, seton placement, anal advancement flaps, and laser techniques have also been mentioned (Sica, 2014; *Department of Surgery - Anal Fistula*, 2019). High recurrence rate (30-50%) has been reported with flap procedures, and 100% persistence rates in Seton procedures. However, fistulectomy with primary sphincter reconstruction has been shown to be effective with low recurrence rates. Furthermore, continence disorders are of minor relevance with this procedure (Seyfried et al., 2018).

The patients often have some discomfort (or mild-to-moderate pain) in the operated are, for the first week during post-operative period; this can be controlled with analgesics (Molloy, 2022). Warm sitz bath, stool softeners, bulk laxatives, wound hygiene, and other supportive treatment must be continued during the post-operative period (Molloy, 2022). Wearing a gauze-pad or mini-pad can prevent the soiling of the clothes from the wound drainage (Molloy, 2022). The complications of fistula surgery include: infection, bowel incontinence, and fistula recurrence (Molloy, 2022). Fistulotomy, one of the commonest surgeries for anal fistulas, have reportedly shown a recurrence risk of about 21% (Molloy, 2022). In case of fistulas associated with Crohn's disease, medical management is considered. A course of 54 weeks of treatment with Infliximab has shown to close the fistula

tract successfully in 36% of cases (Carr & Velasco, 2021; Sands et al., 2004). A staged fistulotomy may be useful if medical management fails.

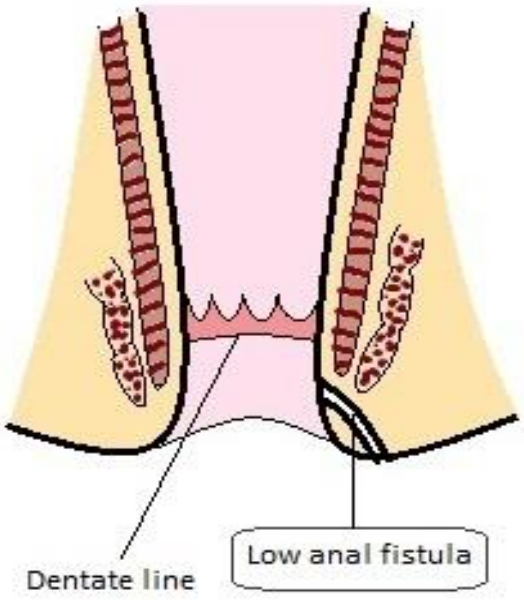


Figure 3: *Diagrammatic representation of a superficially located low anal fistula*

Rectal prolapse:

Rectal prolapse is a full-thickness protrusion of all the layers of the rectum through the anus (Segal et al., 2021). It can occur at any age but is more common in young children and the elderly. Although it is noted in pediatric age group (first decade of life), it is usually a temporary disorder which can be conservatively managed (Segal et al., 2021). It occurs due to weakness of connective tissue supporting the rectum and pelvic floor weakness

(*Rectal Prolapse | ASCRS*, 2022). Certain etiological factors play a role in causing rectal prolapsed including chronic constipation (straining), diarrhea, and multiple vaginal childbirths (*Rectal Prolapse | ASCRS*, 2022). Rectal prolapse is also known to occur due to intestinal hyperperistalsis, raised intra-abdominal pressure, and certain genetic conditions (Segal et al., 2021). Clinical symptoms are mass protruding from the anus usually associated with fecal incontinence; other symptoms include pain/discomfort in anal region, seepage of mucus and blood, and feeling of incomplete evacuation (Segal et al., 2021). DRE reveals a lax sphincter. The patient might be asked to strain on the toilet so as to demonstrate the rectal prolapse. The differential diagnoses include rectal polyp, ileocecal intussusception, colo-rectal intussusception, rectal hemorrhoids, and prolapsing duplication cyst of rectum (Segal et al., 2021). It is important to differentiate rectal prolapse from hemorrhoids; while rectal prolapse involves protrusion of an entire segment of the bowel located at a higher level with visible concentric mucosal folds, hemorrhoids only involve the inner layer of bowel near the anal opening with radially appearing prolapse (Goldstein & Maxwell, 2011; *Rectal Prolapse | ASCRS*, 2022). Rectal prolapse can lead to fecal or flatus incontinence (*Rectal Prolapse | ASCRS*, 2022). The diagnosis of rectal prolapse is mainly clinical, but some tests like videodefecogram and anorectal manometry may be required (*Rectal Prolapse | ASCRS*, 2022). Sigmoidoscopy and colonoscopy may be required in cases of occult rectal prolapse (Segal et al., 2021). Furthermore, assessment of associated pelvic floor anomalies may also be required by MRI or fluoroscopic dynamic defecography (Segal et al., 2021). Rectal prolapse has also been classified as type 1 (false procidentia) and type 2 (true procidentia); type 1 involves partial mucosal prolapse, while type 2 involves full-thickness extrusion of the rectal wall (Segal et al., 2021).

In majority of pediatric patients, conservative management can be helpful, which includes stool softeners, laxatives, avoiding prolonged straining, and treating any underlying conditions (Segal et al., 2021). However, in case of long-standing symptoms and difficult manual reduction of pediatric rectal prolapse, the initial treatment is with injection sclerotherapy, followed by Thiersch stitching, and ultimately rectopexy (Rentea & St Peter, 2018; Segal et al., 2021). Incarcerated rectal prolapse must be relieved by placing the patient on a head-down position, and application of cold compresses over the protruded mass;

manual reduction may be attempted once the swelling is reduced (Goldstein & Maxwell, 2011). For majority of patients with rectal prolapse, surgery relieves or greatly improves the symptoms. Although various abdominal and perineal surgical procedures are defined for this condition, perineal procedures are preferable, because they are associated with lesser morbidity. However, they generally have high recurrence rates and therefore usually reserved for high-risk elderly patients (Hammond et al., 2007). Abdominal procedures include Ripstein's mesh repair, sigmoid colostomy with suture rectopexy, and anterior resection. Perineal procedures include Altemeier's procedure (perineal rectosigmoidectomy), Delorme procedure, and Thiersch anal encirclement (Hammond et al., 2007). Altemeier's procedure is a good surgical option for patients with incarcerated gangrenous rectal prolapse as well as those with a recurrence following another perineal procedure (Goldstein & Maxwell, 2011). However, it is associated with morality rates of 0-5% and recurrence rates of 0-16%; this procedure has also reported to yield poor functional outcomes related to fecal urgency, soiling, and fecal incontinence (Goldstein & Maxwell, 2011). For instance, perineal rectosigmoidectomy with levatorplasty has shown recurrence rates comparable to the abdominal procedures (Goldstein & Maxwell, 2011). Addition of posterior levatorplasty recreates the anorectal angle, improves continence and also short-term recurrence rates (Goldstein & Maxwell, 2011). Delorme procedure is an effective treatment option for partial circumference or short-segment full-thickness rectal prolapse and also for mucosal or partial-thickness rectal prolapse (Goldstein & Maxwell, 2011). The mucosa and submucosa is dissected from the sphincter-complex and the underlying muscularis propria through the transanal approach; the redundant mucosa and submucosa is then excised and reanastomosed following the placation of the muscularis propria (Goldstein & Maxwell, 2011). Thiersch suturing (anal encirclement) is a novel, simple, safe and effective treatment for rectal prolapse (Chauhan et al., 2015). It is suitable for severely ill patients with significant comorbidities (Goldstein & Maxwell, 2011). Although it does not correct the rectal prolapse, it rather provides a physical barrier which prevents further prolapse (Goldstein & Maxwell, 2011). However, it is estimated to recur in about 33-44% of cases (Goldstein & Maxwell, 2011).

The main abdominal surgery for rectal prolapse involves suture rectopexy alone, or in combination with a sigmoid resection (Goldstein & Maxwell, 2011). The abdominal approach involves the rectal mobilization posteriorly, from the sacrum to the level of the anorectal junction (Goldstein & Maxwell, 2011). After the complete rectal mobilization, the rectum is fixed posteriorly to the upper sacrum, i.e. a posterior rectopexy is performed using direct suture fixation; this procedure has shown the recurrence rates from 0 to 9% (Goldstein & Maxwell, 2011). Those patients with significant history of constipation tend to have an associated redundant sigmoid colon; such patients can be benefitted by addition of sigmoid resection to the rectopexy (Goldstein & Maxwell, 2011). Laparoscopic rectopexy has also been performed with good outcomes.

Rectal polyp:

These are benign adenomatous growths from rectal mucosa, majority of which are juvenile polyps. They are commonly located in the rectosigmoid region. It is commonly seen in the age group between 2 to 10 years. These polyps are usually solitary and present as rectal bleeding and mass protruding from anus while defecation (Katsanos et al., 2011). Polyps are better removed even if asymptomatic because of their probability of having neoplastic potential (Coburn et al., 1995). Transanal polypectomy or transanal excision (TAE) of polyp is the standard surgical treatment, although it is limited to polyps <4cm in size and those which lie within 6 to 8 cm of anal verge (Rai & Mishra, 2016).

Anorectal malignancy:

Anal and rectal cancers, although anatomically nearby, are different clinical entities having different risk factors, histological characteristics, cancer staging and management (Matalon et al., 2015). Majority (about 70%) of colorectal cancers are sporadic which are usually diagnosed after 50 years of age (Recio-Boiles et al., 2021). It is recommended that

people over 50 years of age must undergo screening for rectal cancer every 10 years (Recio-Boiles et al., 2021). About 5% of colorectal cancers are associated with genetic syndromes, like familial adenomatous polyposis (FAP) and hereditary non-polyposis colorectal cancer (HNPCC) or Lynch syndrome (Recio-Boiles et al., 2021). CRC has certain risk factors like positive personal/family history, and presence of polyps (adenomatous, tubulovillous and villous types); such patients have a significant risk for developing metachronous or synchronous types of primary colorectal cancer (Recio-Boiles et al., 2021). When the inflammatory bowel disease (IBD), such as Crohn's disease (CD) and ulcerative colitis (UC), involves the rectal area, there is an increased risk for rectal cancer (Recio-Boiles et al., 2021). Studies have also shown increased risk for rectal cancer in those patients who have received radiotherapy for the cancer of prostate (Recio-Boiles et al., 2021). Obesity, alcohol, tobacco, processed meat, androgen suppression therapy, and cholecystectomy have been associated with a modestly increased risk for colonic cancer, but no associated risk for rectal cancer (Recio-Boiles et al., 2021). Furthermore, there is variable evidence related to the protective factors against colorectal cancers, which include: dietary factors (fruits, vegetables, fish, fiber), physical exercise, multivitamin supplements, coffee, and drugs (non-steroidal anti-inflammatory drugs, HRT following menopause, bisphosphonates, etc) (Recio-Boiles et al., 2021). There is clinical evidence suggesting that colorectal cancer arises from the adenomatous polyps, which typically acquire dysplastic changes over a period of 10-15 years, eventually leading to the development of invasive carcinoma. Therefore, early diagnosis and excision of polyps decreases the risk of colorectal cancer (Recio-Boiles et al., 2021). Three major molecular pathways have been linked to the occurrence of colorectal cancer: chromosomal instability, mismatch repair and hypermethylation (Recio-Boiles et al., 2021). Genetic screening (DNA mismatch repair and microsatellite status occurring in about 13% sporadic cases) has been recommended for all the patients who have recently been diagnosed with rectal cancer (Recio-Boiles et al., 2021). Thorough history-taking and clinical examination can often detect suspicious colorectal cancer cases. Malignant anorectal growths could be identified on digital rectal examination, or at times, during on-table examination under anesthesia. A biopsy of the suspicious malignant lesion must be performed to confirm the diagnosis (Recio-Boiles et al., 2021). Staging is done with the help of radiological investigations (CT or MRI). Staging of non-metastatic rectal cancers depends

on the tumor depth (T stage) and the number of regional lymph nodal involvement (N stage) (Matalon et al., 2015). Baseline contrast Computerized Tomography (CT) scan of abdominopelvis and chest is recommended radiological modality for cancer staging before planning surgery (Recio-Boiles et al., 2021). Rigid sigmoidoscopy can identify the distal extent of tumour form the anal verge. TRUS and MRI scan of pelvis can appropriately assess the T and N status of tumour, and are considered as optimal imaging modalities for loco-regional staging of the rectal cancer (Recio-Boiles et al., 2021). Histologically, majority of rectal cancers are adenocarcinomas (90%), while other rare types include adenosquamous, spindle, squamous, and undifferentiated (Recio-Boiles et al., 2021). Adenocarcinomas are further categorized into well-differentiated, moderately-differentiated, and poorly-differentiated; they are also classified based on prognostic significance into low-grade (well-moderate) and high-grade (poor) (Recio-Boiles et al., 2021). The preferred staging system for colorectal cancer is the tumour, doe, metastasis (TNM) staging system of the AJCC/UICC (Recio-Boiles et al., 2021). Management options include surgery, radiotherapy, and chemotherapy; these modalities are used in treating anorectal cancers based on the cancer staging. According to the National Cancer Institute, the five-year survival for CRC patients after treatment is about 65% (Recio-Boiles et al., 2021). In order to avoid loco-distant recurrence and increase survival, an important surgical goal is to attain total mesorectal resection with negative circumferential resection margins (CRM). Since the lymph nodal involvement is the main prognostic factor, resection of minimum 12 lymph nodes has been recommended (Recio-Boiles et al., 2021).

The most appropriate treatment route is determined by the accurate rectal cancer staging. Various treatment modalities for rectal cancer includes: endoscopic resection, neoadjuvant therapy, surgical resection (low anterior resection – LAR/ abdominoperineal resection (APR), adjuvant chemoradiotherapy, and systemic therapy (cytotoxic chemotherapy, VEGF inhibitors, anti-EGFR monoclonal antibodies) (Recio-Boiles et al., 2021). The detailed management of anorectal malignancies is beyond the scope of this study, because the detected cases have mostly been referred for management at a higher center.

Other anorectal conditions:

There are various other anorectal conditions which are worth mentioning. Pruritus ani is condition with chronic intense itching over the perianal skin. It affects 1-5% of the population, and is more common in men. Although it could be idiopathic (no identifiable cause), about 75% of cases have a co-existing anorectal pathology, such as anal fissures or hemorrhoids (Siddiqi, S et al, 2008). Studies have identified various etiological factors for pruritus ani, including: perineal fecal contamination, perianal infection (like *Candida*, threadworms, STD), allergic contact dermatitis, dietary factors, colorectal and anal disease, dermatological conditions and neoplasia, steroid-induced and other medications, clothing, systemic diseases and psychological factors, etc (Siddiqi, S et al, 2008). Pruritus ani is treated by identifying and managing the causative factors, encouraging adequate perineal hygiene, and treating the symptoms with topical steroids, topical capsaicin, or oral anti-histamines (Fargo & Latimer, 2012).

Anogenital warts (or anorectal condylomas) also called "perianal condyloma acuminate", are generally caused by infection with human papillomavirus (HPV - types 6 and 11). These are treated depending on the location and size, using outpatient treatments like cryotherapy, laser treatment, and topical applicants like podophyllin or trichloroacetic acid (Fargo & Latimer, 2012).

Fecal impaction occurs when there is a total or partial occlusion of the distal colon by the dry, hard fecal matter (Fargo & Latimer, 2012). It can present with overflow incontinence or constipation (Fargo & Latimer, 2012). Fecal impaction is commonly noted in bed-ridden and hospitalized older patients and those with spinal cord injuries. An underlying etiology may be present, such as, dietary (low fiber intake), metabolic diseases (hypothyroidism) neurologic (spinal cord injuries), and drug effects (opiate use). Fecal impaction can be treated with enemas, polyethylene glycol, or manual disimpaction (Fargo & Latimer, 2012). Oral PEG along with electrolyte solution has shown good outcomes in

about 89% cases (Chen, C et al, 2005). In an ambulatory patient, medical therapy may be attempted first. One or two enemas (fleet) may be carefully administered into the bolus so as to hydrate and soften the stool; one hour later, the softened stool is passed with the assistance of another mineral oil enema (Pfenninger & Zainea, 2001). If medical management fails, then manual disimpaction can be done under a circum-anal block. Following disimpaction, judicious use of laxatives, enemas, and stool softeners, and/or enemas is advised to avoid the condition from recurring (Pfenninger & Zainea, 2001).

Fecal incontinence is the involuntary lack of control of bowel movements, which may lead to significant embarrassment and social isolation (Fargo & Latimer, 2012). It has been noted in about 2% of general population and 21% of community-dwelling elderly adults (Fargo & Latimer, 2012). Fecal incontinence is clinically classified as: overflow, reservoir, or rectosphincteric (Fargo & Latimer, 2012). Overflow incontinence occurs due to impaction of feces; reservoir incontinence occurs due to reduced colorectal capacity; and rectosphincteric incontinence occurs when there is anatomical or physiological damage to the sphincter mechanism (Fargo & Latimer, 2012). Fecal incontinence is usually managed with biofeedback and anti-motility agent (loperamide) (Fargo & Latimer, 2012); surgery is often reserved for those with anatomic damage to the sphincters (Fargo & Latimer, 2012). Sphincteroplasty is a commonly performed surgical procedure in patients with moderate-to-severe anal incontinence, where the conservative management has failed (Pescatori & Pescatori, 2014). Alternative procedures like artificial bowel sphincter and electro-stimulated graciloplasty have been disapproved because of high morbidity rates. Minimally invasive procedures like injection of bulking agents, and sacral neuromodulation have been used in mild cases, but these methods are costly (Pescatori & Pescatori, 2014).

Other commonly encountered anorectal conditions in the surgical OPD are proctitis and anusitis. Proctitis is the inflammation of the rectal mucosa (Meseeha & Attia, 2021). Anusitis is the inflammation of the anal mucosa/lining. Anusitis is uncommonly diagnosed and often misdiagnosed as hemorrhoids (Meseeha & Attia, 2021). There could be various causes for proctitis/anusitis, which includes: chronic radiation proctitis, ulcerative colitis, proctopathy, and diversion proctitis. Certain infectious causes can also be present, such as,

Clostridium difficile, Salmonella, Campylobacter, E. coli, amoebiasis, and sexually transmitted diseases (Chlamydia, Gonorrhea, Syphilis, Lymphogranuloma venereum, CMV, chancroid, HSV, and HPV). Other causes include vasculitis, ischemia, medication side-effects, or toxins like hydrogen peroxide enemas (Meseeha & Attia, 2021). Dietary factors are the commonest cause for anusitis, which could be due to intake of excess citrus, beer, coffee, cola, spices, garlic, and sauces (Meseeha & Attia, 2021). Sometimes it is caused by diarrhea occurring after intake of laxatives (such as during colonoscopy preparation); stress could also be a possible etiologic factor (Meseeha & Attia, 2021). Common symptoms associated with these conditions include: painful defecation, bloody/purulent discharge, and pruritus (Meseeha & Attia, 2021). However, the clinical features, evaluation, and treatment vary depending upon the etiological condition causing the proctitis/anusitis (Meseeha & Attia, 2021). In our study, we have considered those cases which don't fit in the diagnoses of fissures/piles as proctitis, for all practical purposes. Such cases have usually been treated with medical (conservative) management.

Anal stenosis is an uncommon condition with narrowing of the anal canal. It can be due to a true anatomic stricture or due to muscular and functional stenosis (Brisinda et al., 2009). Anal stenosis is a potentially serious, most feared and disabling complication of anorectal surgery. About 90% of anal stenosis cases occur due to overzealous hemorrhoidectomy (Brisinda et al., 2009). Treatment includes medical and surgical options, depending upon the severity of anal stenosis. Mild stenosis can be managed conservatively by fiber supplements or stool softeners. Daily (or regular) mechanical or digital anal dilatations may be advisable. Surgical sphincterotomy can also be adequate for milder cases. More severe anal stenosis may be associated with a loss of anal canal tissue, which can be treated by a formal anoplasty. Various flap techniques have been mentioned for performing anoplasty, including V-Y/Y-V anal advancement flaps and others (Brisinda et al., 2009). Anal stenosis can be prevented by preserving adequate muco-cutaneous bridges during the Milligan-Morgan Hemorrhoidectomy (Brisinda et al., 2009). With our experience, we can say that the sclerosis or contracture of external anal sphincter can cause severe anal stenosis.

Perianal conditions in patients with inflammatory bowel disease (IBD) can pose significant problems although they tend to be under-noticed (Choi et al., 2018). While perianal disease can be a characteristic of patients with Crohn's disease, it has often been overlooked in ulcerative colitis (Choi et al., 2018). Hence, in order to improve the quality of life of patients with ulcerative colitis, careful examination and appropriate management for perianal disease is emphasized. The types of perianal diseases in IBD could range from more favorable conditions like fissures and hemorrhoids, to more severe and disabling conditions like abscesses and fistulae. The incidence of perianal diseases in IBD varies between 13% and 45% (Choi et al., 2018). The recent developments of imaging and endoscopic techniques have aided in identification of IBD related to perianal diseases. However, perianal conditions under the setting of IBD may be difficult to manage because of complications (Choi et al., 2018). Management of fissures and hemorrhoids in patients with IBD can pose significant difficulty in comparison with the normal population (D'Ugo S et al, 2015). Several studies have reported increased incidence of postoperative complications and potentially severe events in IBD patients compared to general population. Management often begins with medical therapy, and in non-responding cases, judicious use of surgical options on highly selective basis has shown acceptable results (D'Ugo S et al, 2015).

Functional defecation disorders, functional anorectal pain, and fecal incontinence comprise a group of conditions termed as "functional anorectal disorders" (Bello et al., 2018). Fecal incontinence is defined as recurrent uncontrolled passage of feces (stools) for a minimum duration of 3 months (Rao et al., 2016). Imaging and anorectal manometry are helpful in assessing the anatomy and physiology of the anus and the floor of pelvis (*Common Anorectal Disorders: Topics by Science.gov*, 2014). Anti-diarrheal agents, patient education, and biofeedback therapy are the primary focus of treatment, while surgery may be considered in refractory cases (Rao et al., 2016). Functional defecation disorders can be defined by presence of two (or more) symptoms pertaining to chronic constipation or irritable bowel syndrome with constipation (IBS-C), in addition to two (or more) features of impaired evacuation, i.e. abnormal balloon expulsion test, abnormal evacuation pattern on manometry, or impaired rectal evacuation by imaging (Rao et al., 2016). There are two subtypes of functional defecation disorders, viz. dyssynergic defecation and inadequate

defecatory propulsion (Rao et al., 2016). Functional anorectal pain syndromes are deciphered clinically, and are classified into three categories, viz. levator ani syndrome, proctalgia fugax, and unspecified anorectal pain (Rao et al., 2016). There is a typically fleeting pain lasting for seconds to minutes in proctalgia fugax. The pain lasts for >30 minutes in unspecified anorectal pain and levator ani syndrome; levator ani syndrome is typically associated with puborectalis tenderness (Rao et al., 2016). Pelvic floor biofeedback therapy is effective in the treatment of functional anorectal disorders (Rao et al., 2016). The role of surgery in functional anorectal disorders is limited and controversial with varying rates of success (Bello et al., 2018).

The term “constipation” has been used in various ways by the patients, such as, “decreased frequency of bowel movements, difficulty in passing hard stools, lack of urge to defecate, prolonged straining at toilet, and sensation of incomplete evacuation” (Pfenninger & Zainea, 2001). However, constipation is generally considered when there are less than 3 bowel movements per week in a person who consumes at least 19g of fiber daily (Pfenninger & Zainea, 2001). Constipation can be caused by various factors like diet, functional disturbances, medications, metabolic and endocrine diseases, collagen vascular disease, colonic inertia or peripheral/central neuromuscular disorders (Pfenninger & Zainea, 2001). The clinician must rule out painful anal lesions or obstructing lesions in those presenting with constipation.

Pilonidal sinus has not been included in the statistics of our study as it cannot be considered as an anorectal disorder per se. However, we have rarely come across pilonidal fistula-in-ano, when the pilonidal sinus was intra-operatively found to have a communication with the anal canal forming a fistulous tract (Shankar & Haray, 2001).

MATERIALS AND METHODS

We followed a structured approach for this research problem, with predetermined objectives, design, and samples. Data collection, observation and analysis were performed.

Aims and objectives:

- To study the demographic profile of anorectal disorders
- To study the symptomatology of various anorectal disorders
- To study the proportion of various anorectal disorders
- To study the incidence of anorectal malignancy
- To study the surgical management of anorectal disorders

Description of the Study Area: Dharwad city is a district located in north Karnataka state of India. Hubballi-Dharwad is often considered as twin cities. With a total population of about 20 lakhs, Dharwad is famous for 4 "P": Pedha, Peru, Pensioners, and Piles. Shreeya Hospital is a private health center in Dharwad which has been serving the patients with piles in the rural and urban population, since many years. It has been a referral center for patients with anorectal disorders all over Karnataka, mainly the north Karnataka. However, patients from all over the state, as well as the neighboring states of Maharashtra, Goa, and Andhra Pradesh, have been taking treatment from our hospital. With thousands of patients treated annually, the hospital can potentially be considered as a 'center of excellence' in the management of anorectal disorders.

Research Design: This was a retrospective observational study (descriptive research design) involving the patients with anorectal disorders at our hospital throughout the year 2018. The data included epidemiology, symptomatology, diagnosis, and surgical treatment undertaken. These were collected from the respective registers and records maintained by the hospital staff. Statistical analysis was performed using SPSS software wherever necessary.

Sampling: Observational sampling; non-probability sampling as determined by the inclusion and exclusion criteria.

Data collection and Analysis: The method of data collection was by observation of data sheet (document schedule). Descriptive information was collected using a structured approach of data collection. Epidemiology, diagnosis, and surgical treatment data were taken from the hospital records (annual audits). The hospital records included OPD and IPD files, major and minor OT records which are maintained by the appropriate staffs. Data editing, coding and data entry was done. The data was tabulated in MS excel sheet, and a data matrix was constructed. Variables were statistically analyzed using SPSS software wherever necessary. A descriptive (Observational) study and analysis was done on the collected data.

Duration: 1 year (January 2018 – December 2018)

Inclusion criteria: All anorectal cases admitted and surgically treated at Shreeya Multispecialty Hospital, Dharwad, irrespective of age and sex.

Exclusion criteria: Patient who denied treatment at our hospital; Patients managed conservatively (treatment on out-patient basis); Patients with functional anorectal disorders.

Methodology: The patients attended the out-patient department (OPD) of Shreeya Multispecialty Hospital, Dharwad with various symptoms of anorectal disorders. After history-taking, the patients underwent physical examination. Per-rectal examination was done in the left lateral decubitus position under adequate lighting. Inspection was done by gently retracting the gluteal muscles, to note any visible swelling, mass, ulcerations, bleeding, discharge, external openings, and the surrounding skin. Digital rectal examination (DRE) was done with gloved fingers after lubricating with 2% lignocaine jelly. Any induration, tenderness, palpable fistula tracts, hemorrhoidal masses, ulceroproliferative masses and other relevant findings were noted. The sphincter tone was assessed manually. Patients with severe anal pain were deferred from DRE. Those with no pain underwent

proctoscopy (or anoscopy) to inspect the anorectal mucosa. After the clinical diagnosis, the patients were admitted and routine blood investigations done. Preoperative preparation with antibiotics, analgesics, antacids, antiemetics, and proctoclysis was done wherever necessary. The patients were ensured that they were nil orally for an adequate time (5-6 hours) prior to the surgical procedure. The surgical interventions were broadly classified into minor and major. Minor procedures were done under short general anesthesia (SGA), while major procedures were done under spinal anesthesia (SA). Certain cases with diagnostic dilemmas were subjected to examination under anesthesia (EUA) and further managed accordingly. From the anesthetic point of view, drugs like thiopentone, ketamine, propofol, and pentazocine (fortwin) have been used at individualized dosages for short general anesthesia, under strict monitoring by anesthetist.

Anal fissures were treated with controlled anal dilatation (modified Lord's procedure) under short general anesthesia as a day-care procedure. With the patient in the left lateral position, controlled manual stretching (dilatation) of the anal sphincter was done by inserting four fingers after adequately lubricating with 2% lignocaine jelly. Any associated sentinel piles or hypertrophic anal papilla were simultaneously excised. Thrombotic external piles underwent excision and removal of thrombus (thrombectomy). Certain mildly symptomatic cases of proctitis, grade 1 and 2 hemorrhoids were also subjected to anal dilatation. Supportive treatment such as laxatives, fiber supplements, and sitz bath was judiciously given to the patients.

Hemorrhoids of grades 2, 3, and 4 were treated with open hemorrhoidectomy (Milligan-Morgan's procedure) under spinal anesthesia. The patients were placed in the lithotomy position. The primary hemorrhoidal pedicles at 3, 7 and 11 O' clock were grasped by Allis forceps and ligated with absorbable sutures; this prior ligation reduced the post-operative bleeding considerably. The hemorrhoidal mass was dissected from its bed from external to internal until the pedicle was reached, then the second transfixing ligature was applied proximal to the first ligature. It is also noteworthy that the external sphincter muscles were carefully moved away from the pile mass while its dissection from the bed. The scalpel needs to be held flat with the skin surface to avoid deep dissection, during the

dissection of the pile mass from its bed. After removal of the hemorrhoidal masses at 3, 7 and 11 O' clock positions, the edges of the external skin wounds were approximated loosely and no tight stitches to avoid post-operative pain, and dressing was done with gamgee pads. Certain selected cases with internal hemorrhoids of grades 2 and 3 were treated with Stapled hemorrhoidopexy under spinal anesthesia. Also, some selected grade 2 hemorrhoids were treated with piles ligation under short GA.

Fistula-in-ano was clinically classified into low and high fistulas for management purposes. Low anal fistulas were treated by fistulectomy under short GA with the patient placed in the lithotomy position. A simple method has been used wherein an artery forceps is inserted through internal opening of fistula as a probe, and brought out externally, the small fistula tract is then excised in-toto. High anal fistulae required radiological imaging for the anatomical characterization of the fistula tracts. Transrectal ultrasonography or MRI fistulogram were employed for diagnostic purposes. Many fistulas ended blindly in the ischiorectal fossa with no internal opening. High and complex fistula-in-ano was treated with fistulectomy under spinal anesthesia. The wounds were either primarily sutured or left open for secondary healing and dressing applied. Fistulectomy specimens were sent for histopathological examination.

Anorectal abscesses (perianal and rectal abscesses) were treated with incision and drainage under short GA, with the patient in the lithotomy position. Some abscesses occurred in the horse-shoe form, and some were very deep till the levator ani. The pus was drained and a swab was sent for microbial culture and sensitivity. The wound was cleaned and washed thoroughly; it was kept open and packed with dressings.

Rectal prolapse was treated with Thiersch stitching. Rectal polyp was treated with transanal excision (polypectomy). Anorectal malignancies were biopsied and sent for histopathological examination. When the biopsy confirmed the malignancy, the patients were subjected to radiological imaging (contrast CT scan or MRI) for cancer staging and operability. Although most cases of anorectal malignancies were referred to higher centers, some underwent surgery in our hospital. They underwent abdominoperineal resection (APR)

under spinal anesthesia. We made efforts to avoid colostomy in such patients, and brought down the stoma as coloanal/coloperianal anastomosis, thereby creating a ‘neoanus’.

The patients were postoperatively monitored. Anal dilatation cases were performed on day-care basis and discharged on the same day, while other cases were admitted for an additional postoperative period. Patients were followed up after a month through telephone calls and follow-up visits for a short-term follow-up. 1 year later, the patients were again followed up to assess long-term results (like recurrence and complications). The visual analogue scale (VAS) was used to objectively assess the severity of pain. The Bristol stool chart (figure 4) has been used to classify feces into 7 groups; it has been useful in diagnosing constipation, diarrhea, and irritable bowel syndrome (*Bristol Stool Chart | Continence Foundation of Australia*, 2019).

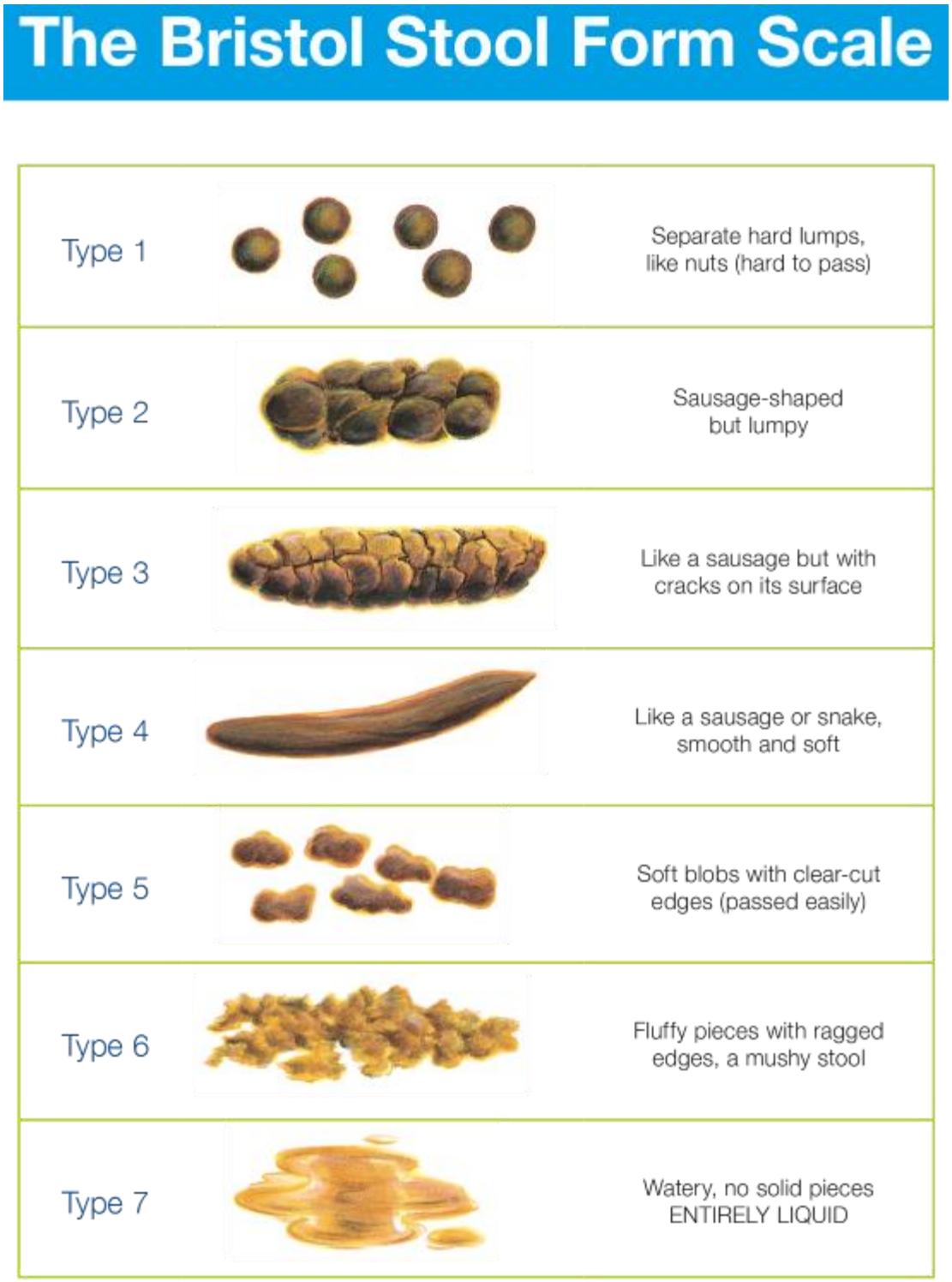


Figure 4: *The Bristol stool form chart/scale used to categorize the feces into 7 groups or types. Types 1 & 2 indicate constipation; types 3 & 4 indicate ideal stools which are easier to pass; and types 5-7 indicate diarrhea and urgency to pass stools (Bristol Stool Chart | Continence Foundation of Australia, 2019)*

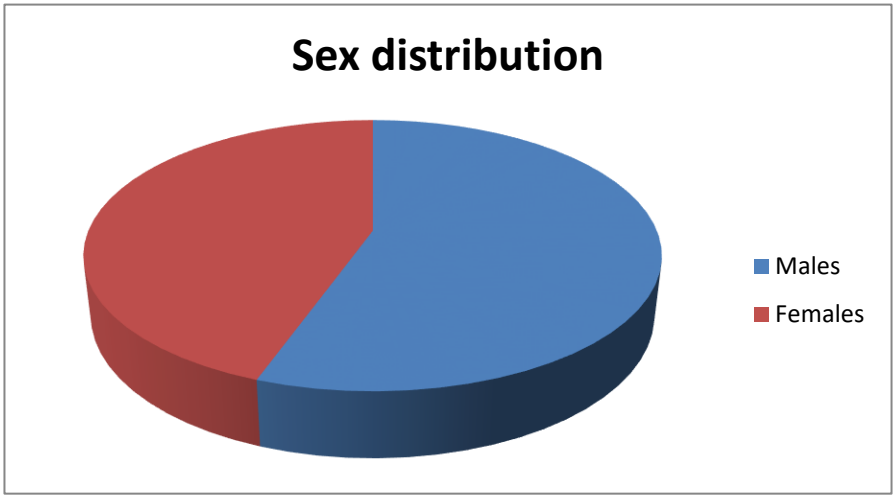
RESULTS AND DISCUSSION

A total of 5345 cases with anorectal disorders were included in the study, which underwent treatment in our hospital during the year 2018. Males were 2965 (55.47%) and females were 2380 (44.53%); there was a male preponderance for anorectal disorders with a male: female ratio of 1.24: 1 (Table 2 & figure 5 represent the percentage distribution of sex in anorectal disorders).

Table 2: *Sex distribution of anorectal disorders*

Sex	**No. of cases**	**Percentage**
Males	2965	55.47%
Females	2390	44.53%
Total	**5345 cases**	

Figure 5: *Sex distribution of anorectal disorders*

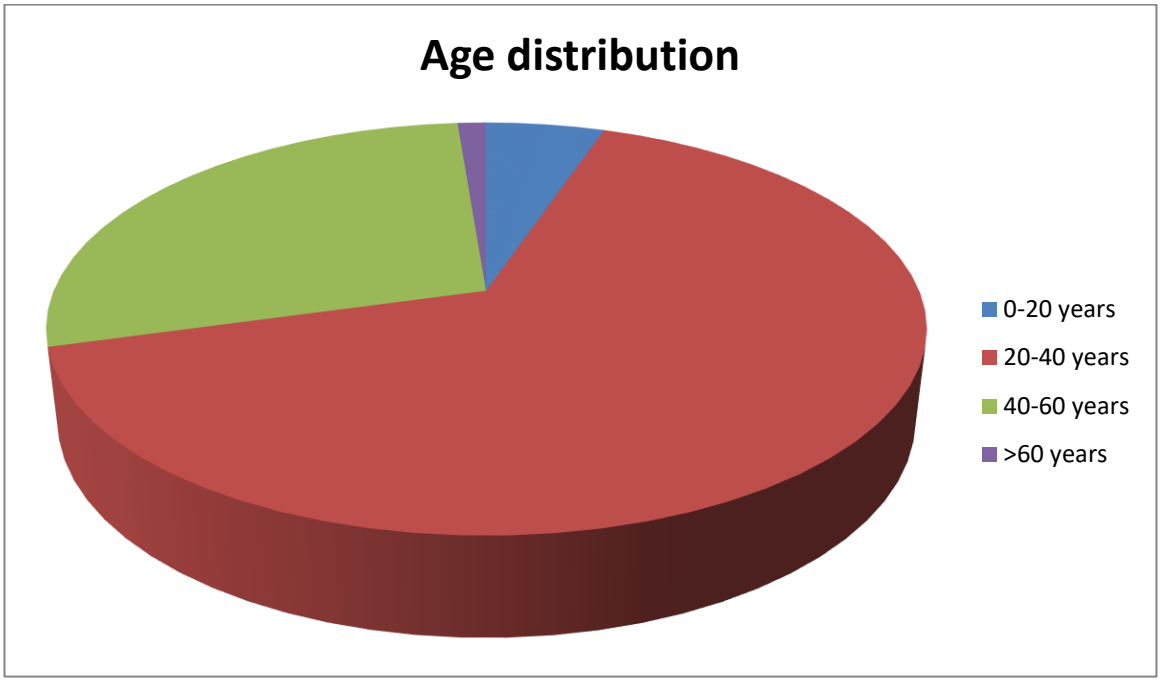


Frequency distribution of age of the patients has been grouped into: 0-20 years, 20-40 years, 40-60 years, and >60 years. The majority of cases (3367 cases; 62.99%) belonged to the age group of 20-40 years (Table 3 and figure 6).

Table 3: *Age distribution of anorectal disorders*

Age group	**No. of cases**	**Percentage**
0-20 years	267	5.01%
20-40 years	3367	62.99%
40-60 years	1445	27%
>60 years	266	5%

Figure 6: *Age distribution of anorectal disorders*

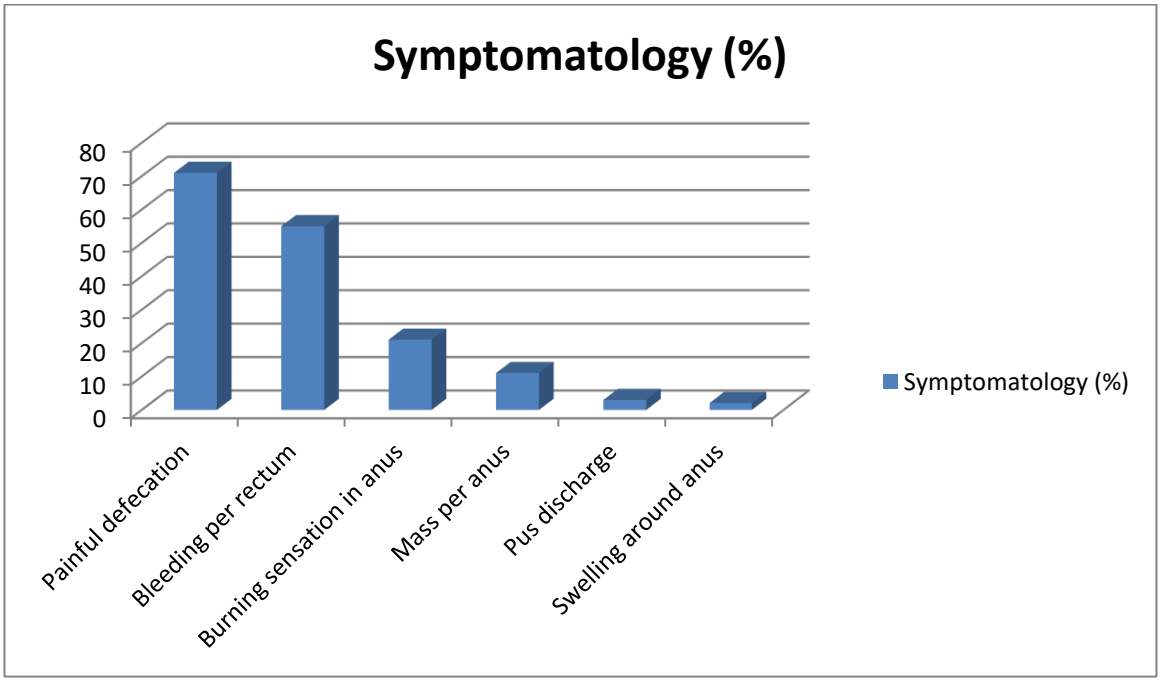


The most common symptoms observed were painful defecation (3795 cases; 71%), bleeding per rectum (2940 cases; 55%), burning sensation in the anal region (1123 cases; 21.01%), mass per anus (590 cases; 11.03%), pus discharge (160 cases; 2.99%), and swelling around the anus (111 cases, 2.07%) (Table 4 & figure 7). Other uncommon clinical features of anorectal disorders observed were tenesmus (feeling to pass stools even after bowel is already emptied), diarrhea, anal irritation/itching/discomfort, frequent passage of stools, straining at stools, abdomen pain (especially lower abdomen), fecal soiling, seepage of stools, coccxalgia (or coccydynia – tailbone pain), mucus discharge PR, urinary symptoms, and perineal descent. The visual analogue scale (VAS) scale was used to objectively evaluate the pain severity. The characteristics of bleeding PR were enquired regarding the amount and type of bleeding; passage of lesser amount of blood (about a spoonful) in the form of drops was usually observed in fissure-in-ano; whereas passage of huge amount of blood (about a cup) in the form of splashing/spraying of blood was usually observed in hemorrhoids (piles). This apparent clinical association could be helpful to diagnose whether the cause of bleeding is fissure or hemorrhoids.

Table 4: *Symptomatology of anorectal disorders*

Symptoms	**No. of cases**	**Percentage**
Painful defecation (or anal pain)	3795	71%
Bleeding per rectum	2940	55%
Burning sensation in anus	1123	21.01%
Mass per anus	590	11.03%
Pus discharge	160	2.99%
Swelling around anus	111	2.07%

Figure 7: *Symptomatology of anorectal disorders*

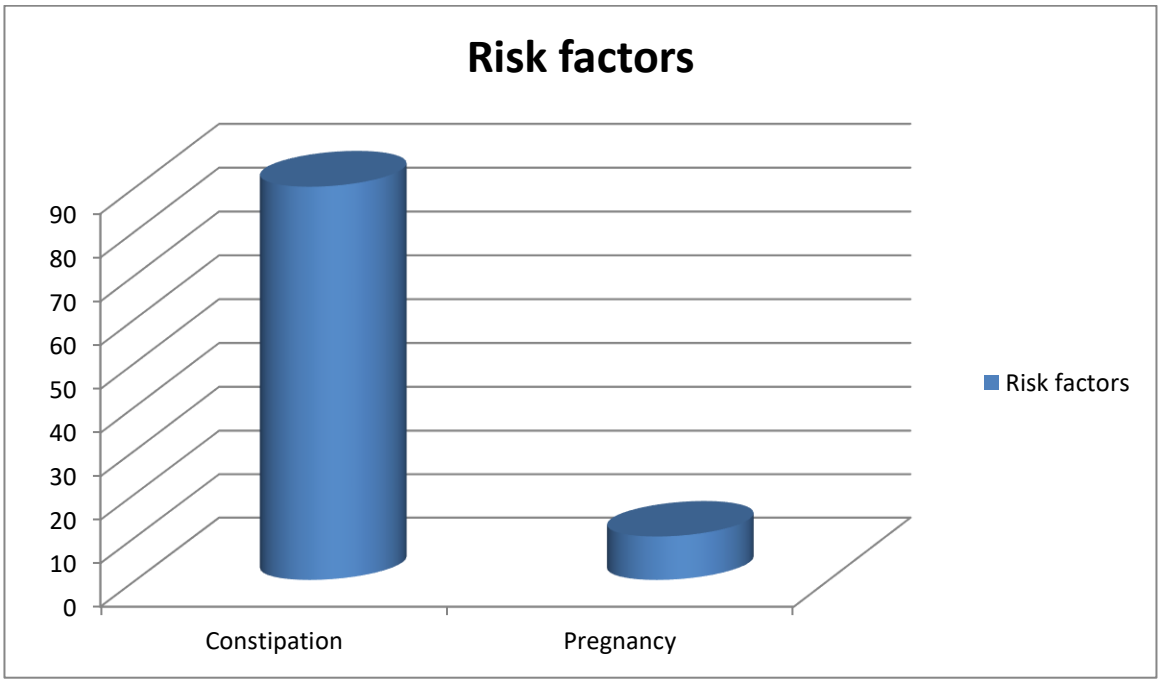


Constipation and pregnancy were the predominant risk factors noted, the former was observed in about 90% and the latter was observed in about 10% of anorectal cases (Table 5 & figure 8). It is noteworthy that about 10% of cases had pregnancy as a risk factor; this constitutes those who were pregnant/post-partum, and those who had developed anorectal symptoms during pregnancy/post-partum. The Bristol stool chart was used to assess the form of feces and classify it into 7 groups; this aided in diagnosing altered bowel habits like constipation and diarrhea.

Table 5: *Risk factors for anorectal disorders*

Risk factor	No. of cases	Percentage
Constipation	4810	89.99%
Pregnancy	534	9.99%

Figure 8: *Risk factors for anorectal disorders*

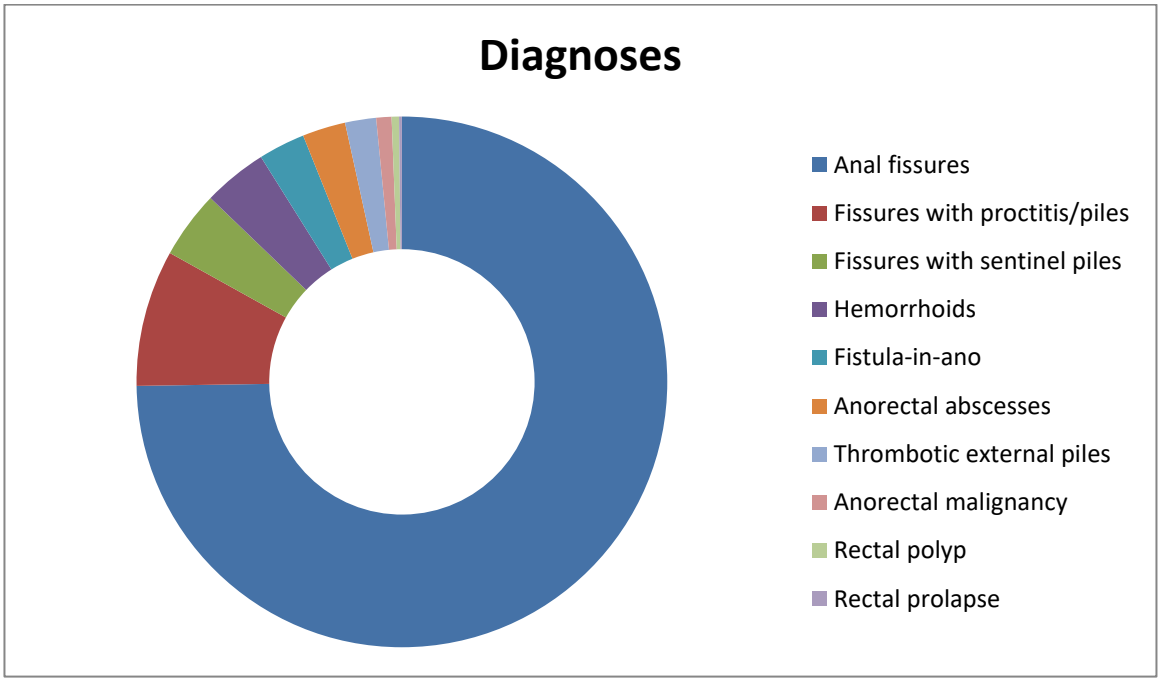


Commonly diagnosed anorectal disorders were: anal fissures (3996 cases, 74.76%), fissures with proctitis/piles (444 cases; 8.31%), fissures with sentinel piles (220 cases; 4.11%), hemorrhoids (209 cases; 3.91%), fistula-in-ano (152 cases; 2.84%), anorectal abscesses (140 cases; 2.63%), thrombotic external piles (101 cases; 1.89%), anorectal malignancy (50 cases; 0.93%), rectal polyp (24 cases; 0.45%), and rectal prolapse (9 cases; 0.17%) (Table 6 & figure 9). It is emphasized that there have been 50 cases of anorectal malignancy, i.e. the incidence of anorectal malignancy was 0.93%. It can be implied that majority of anorectal conditions (93.93%) can be attributed to fissure-in-ano, hemorrhoids, and fistula-in-ano.

Table 6: *Common diagnoses of anorectal disorders*

Diagnosis	No. of cases	Percentage
Anal fissure (or fissure-in-ano)	3996	74.76%
Fissures with proctitis/piles	444	8.31%
Fissures with sentinel piles	220	4.11%
Hemorrhoids	209	3.91%
Fistula-in-ano	152	2.84%
Anorectal abscesses (including perianal and rectal abscesses)	140	2.63%
Thrombotic external piles	101	1.89%
Anorectal malignancy	50	0.93%
Rectal polyp	24	0.45%
Rectal prolapse	9	0.17%
Total No. of Cases	**5345**	

Figure 9: *Common diagnoses of anorectal disorders*

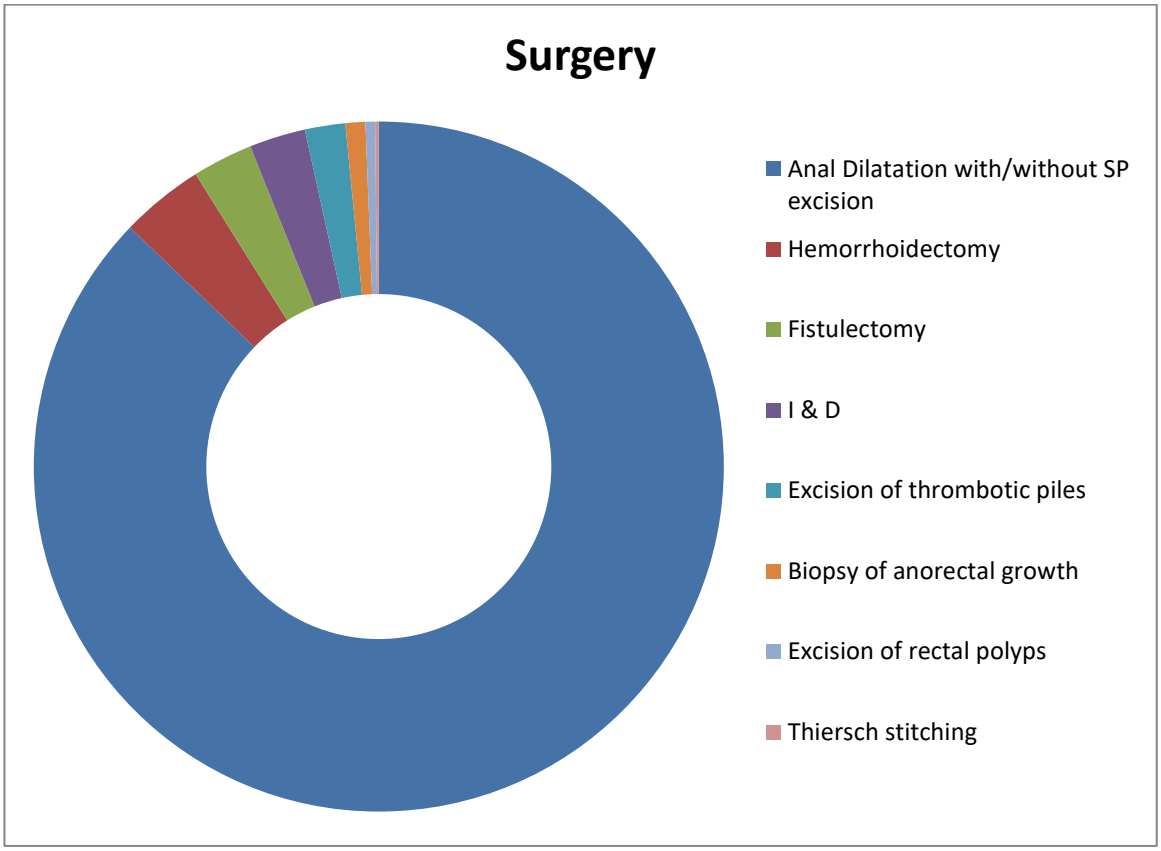


The surgical procedures performed in our setup included: Anal Dilatation with/without excision of sentinel piles (4660 cases; 87.18%), hemorrhoidectomy including open and stapler procedures (209 cases; 3.91%), fistulectomy (152 cases; 2.84%), incision and drainage (I & D) of abscess (140 cases; 2.63%), excision of thrombotic external piles (101 cases; 1.89%), biopsy of anorectal growths (50 cases; 0.93%), transanal excision of rectal polyps (24 cases; 0.45%) and Thiersch stitching (9 cases; 0.17%) (Table 7 & figure 10). It is noteworthy that some patients with generalized debility had fecal impaction; such cases were subjected to proctoclysis and manual fecal evacuation following anal dilatation. Certain cases of anal stenosis/stricture were subjected to anal dilatation and anoplasty. There have been instances of rare organic anorectal disorders like colorectal intussusception, anorectal melanoma, and solitary rectal ulcer syndrome which have been managed accordingly; these have not been included in the data because of statistical insignificance.

Table 7: *Surgical procedures performed for anorectal disorders*

Surgery performed	**No. of cases**	**Percentage**
Anal Dilatation with/without excision of sentinel piles	4660	87.18%
Hemorrhoidectomy (including open and stapler procedures)	209	3.91%
Fistulectomy	152	2.84%
Incision & drainage	140	2.63%
Excision of thrombotic external piles	101	1.89%
Biopsy of anorectal growth	50	0.93%
Excision of rectal polyps	24	0.45%
Thiersch stitching	9	0.17%
Total No. of Cases	**5345**	

Figure 10: *Surgical procedures performed for anorectal disorders*



Recurrence of disease was noted at 1 year of follow-up. Some patients had minor symptoms of anal irritation and minimal bleeding per rectum during short-term follow-up after anal dilatation for fissure-in-ano. Those who underwent other operative procedures also developed post-operative pain and bleeding; pain was controlled with appropriate analgesics while bleeding was often controlled with local compression for a few minutes. Most of the patients were discharged uneventfully.

The recurrence rates have been studied for the three commonly performed procedures in our setup, i.e. anal dilatation, hemorrhoidectomy, and fistulectomy. About 52 cases of fissure-in-ano who underwent anal dilatation (modified Lord's procedure) showed a recurrence of disease at 1 year, i.e. recurrence rate of 1.11% has been noted with anal dilatation procedure. Among 209 cases of hemorrhoids treated with hemorrhoidectomy, 3

cases showed recurrence at long-term follow-up, i.e. recurrence rate of 1.43% has been noted with hemorrhoidectomy. Among 152 cases of fistula-in-ano treated with fistulectomy, 8 cases showed recurrence at long-term follow-up, i.e. recurrence rate of 5.26% has been noted with fistulectomy (Table 8).

Table 8: *Recurrence within 1 year following surgical procedure*

Surgical procedure	Recurrence (No. of cases)	Recurrence (percentage)
Anal dilatation	52	1.11%
Hemorrhoidectomy	3	1.43%
Fistulectomy	8	5.26%

Immediate post-operative complications like pain and bleeding have been observed in many patents as a usual post-operative outcome. However, we did not encounter any long-term complications like major anal incontinence or sphincter injuries with any of our surgical procedures. The outcomes of our procedures were satisfactory with no mortality reported.

It is noteworthy that in our experience, one in every three cases of high fistula-in-ano had no internal opening and ended blindly into the ischiorectal fossa during intraoperative exploration; this suggests the possible origin of high anal fistulas from the ischiorectal fossa, rather than cryptoglandular involvement. Moreover, most of such high anal fistulas were found to extend very high at the level of levator ani muscles. Dissection is difficult in such cases and many a times stops in the middle leading to a high recurrence rate. We may suggest that an ideal way of surgery is to follow through the fistula tract only, which

minimizes the disturbance and destruction of surrounding sphincter fibers. The lesser the damage to the sphincter fibers, the lesser is the possibility of anal incontinence.

DISCUSSION:

This study can be comparable to various other anorectal studies. One study showed that the most common diagnosis among perianal disorders was hemorrhoids (49%) and fistula-in-ano (29%); most commonly affected age group was 18-45 years (64%). Bleeding per rectum was the most common symptom followed by anal discharge and itching. Constipation, poor perianal hygiene, chronic straining, pregnancy and others were identified as the common predisposing factors for anorectal disorders. Majority (96%) of patients were managed surgically, with no mortality and a minimal recurrence of about 2% (Sharma et al., 2017). It has been suggested that surgical management is the most definitive treatment for most of the perianal disorders, as it is associated with minimum recurrence (Sharma et al., 2017).

Shah Alam et al have conducted an observational retrospective study regarding the prevalence and risk factors of various anorectal disorders. This study reported that anal fissure, hemorrhoids, and pruritus ani were responsible for more than 81% of patients with anorectal complaints (S. Saiyad et al., 2018). The age group that was most commonly affected was 41-50 years, followed by 31-40 years; with a male preponderance (70.13%). The risk factors noted were non-vegetarian /mixed food, lower socioeconomic status, and prolonged straining during defecation. The commonly presenting symptoms were anal pain + bleeding per rectum, followed by anal pain only, and mass during defecation. The proportion of anorectal disorders were fissure-in-ano (36.2%), hemorrhoids (33.94%), fistula-in-ano, and prostatitis. The location of anal fissures was mostly observed in posterior midline (85%), anterior midline (12.5%) and lateral (2.5%) (S. Saiyad et al., 2018).

A study consisting of 416 subjects with anorectal diseases was performed by Khan et al; this study reported the prevalence of fissure-in-ano as 15.62%, with a male preponderance (76.20%) (Mansoor Khan, 2015). Only 5 patients among those with anal fissures had coexisting hemorrhoids. The commonest affected age group was 15-40 years. Bleeding per rectum along with anal pain were the commonest presenting symptoms. About half of the subjects with anal fissures were noted to be obese/overweight. Constipation, low

fiber diet, and lack of physical activity (sedentary lifestyle) have been mentioned as the modifiable risk factors (Mansoor Khan, 2015). The internal anal sphincter spasm has been noted as the most common reason for non-healing of anal fissure. According to the study, anal fissures stand third in prevalence of anorectal conditions, after chronic constipation and hemorrhoids. The incidence of anal fissures among the general population has been reported as 1 in 350 adults (Mansoor Khan, 2015).

A study by Chaudhary and Dausage has showed the prevalence of anal fissures among the anorectal disorders as 17.81%, with a male preponderance (69.63%) and the commonly affected age group was 18-40 years; the mean SD age was 38.27 years (Chaudhary & Chirag Shanti Dausage, 2019). The risk factors for anal fissures identified in this study were mixed (non-vegetarian) diet, low fiber diet, constipation, and lack of exercise (physical activity). Overweight and obesity was observed in about 45% of patients. Bleeding PR and anal pain was the commonest presenting symptom (Chaudhary & Chirag Shanti Dausage, 2019).

A prospective study of anorectal diseases was done in Sudan by Osman Elriah et al. It consisted of 107 anorectal patients with a mean age of 38.6 $\pm$ 13.7 years (Mohammed et al., 2016). Majority of patients (78.5%) were in their third to fifth decade of life. The proportion of male patients was two-thirds; there was a male preponderance with a male: female ratio of 1.9:1. Most patients (72%) presented with the common symptom triad of anal pain, bleeding PR, and constipation or difficulty in passing stools. The three commonly diagnosed anorectal disorders were hemorrhoids (61.7%), fissure-in-ano (14%), and fistula-in-ano (10.3%) (Mohammed et al., 2016). It was noted that majority of patients with hemorrhoids (72.7%) had second or third degree hemorrhoids. Among those with fissure-in-ano, 93% were acute fissures and 86.7% were located at posterior midline (most common location). Among those with fistula-in-ano, majority (91%) were low-type and most of the cases were simple fistulas located anteriorly. Surgical management was done in 68.2% of cases included in this study. Open/closed/ligasure hemorrhoidectomy was employed for the treatment of hemorrhoids. In case of fissure-in-ano, conservative treatment showed a cure rate of 87% in acute fissures and 50% in chronic fissures (Mohammed et al., 2016). This

study has considered lateral internal anal sphincterotomy (LIAS) as the gold-standard as well as first-line treatment for chronic anal fissures. However, this study has employed LIAS (69%) and anal dilatation (30.8%) procedures to treat fissure-in-ano. Among those with fistula-in-ano, two-thirds of cases were treated with fistulectomy, and the remainder with fistulotomy and Seton procedures (Mohammed et al., 2016). No mortality was reported in the study, although complications like intractable post-operative pain occurred in about 6.1% of cases. The admitted patients were usually discharged within 24-hours on a day-care basis. Furthermore, this study reported the prevalence of malignancy among anorectal conditions as 0.9% (Mohammed et al., 2016).

Varadarajan et al identified the prevalence of anal fissures among various anorectal ailments as 30.7% (Varadarajan et al., 2018). There was a slight male preponderance and the commonly affected age group was 31-40 years. The common presenting symptoms included painful defecation (86%), bleeding PR (62%), constipation, pruritus and discharge (Varadarajan et al., 2018). Most of the anal fissures were acute (76%), while the remaining 24% were chronic; the commonest location of fissures was posterior midline (98%) (Varadarajan et al., 2018). This study has documented certain etiological factors for anal fissures, including passage of hard stools, poor hygiene of anal region, intake of spicy foods, and iatrogenic causes (Varadarajan et al., 2018).

Another study of anorectal disorders done by Sarkar et al., showed male preponderance with males being 71.7% and females being 28.29%; thus the male: female ratio was 2.5:1 (Sarkar et al., 1970). About 40% of cases belonged to the age group of 21-30 years. Bleeding per rectum (63.59%) and anal pain (56.16%) were the most common symptoms noted (Sarkar et al., 1970). Internal hemorrhoids (60.22%) and anal fissure (50.42%) were the most common diagnoses; 27.17% of cases had both hemorrhoids and anal fissures. Malignancy was noted in 1.4% of cases (Sarkar et al., 1970). Certain studies have identified that modifiable risk factors like lack of physical activity (exercise), overweight and obesity have significant association with anal fissures (Mansoor Khan, 2015; Chaudhary & Chirag Shanti Dausage, 2019).

Certain observational studies have identified the association of anorectal conditions with pregnancy. It has been reported that about two-thirds of pregnant women have anorectal symptoms during pregnancy and post-partum, especially anal fissure and hemorrhoidal complications (Ferdinande et al., 2018). Our study identifies pregnancy as a risk factor for about 10% of anorectal diseases; this can be attributed to those women who were pregnant or during their post-partum period. However, the most important risk factor in pregnancy is again, constipation. Hence, it is highly recommended to prevent constipation in pregnant women (Ferdinande et al., 2018).

Our observational study has included 5345 cases with anorectal disorders and has shown results comparable to the aforementioned studies. In our study, males (55.47%) were marginally higher than females (44.53%); thus male predominance was observed with male: female ratio of 1.24: 1. The most commonly affected age group was 20-40 years, followed by 40-60 years, suggesting that anorectal conditions commonly affects the middle-aged productive population. The two most prominent risk factors for anorectal disorders in our study were: constipation and pregnancy. However, the other risk factors have not been studied. The common anorectal symptoms in the decreasing order of frequency were: anal pain (painful defecation), bleeding per rectum, burning sensation in anus, mass per anus, pus discharge, and swelling around the anus. These symptoms correspond to the commonly encountered anorectal disorders.

A study of hemorrhoids in a family practice population observed that hemorrhoids, fissures, and polyps were the commonest causes for rectal bleeding; this study has suggested that if any of these three common causes were detected as a possibility for underlying bleeding, then other investigations like colonoscopy were not usually necessary (Pfenninger & Zainea, 2001; Trilling, 2022). However additional studies may be warranted if the bleeding pathology remains unidentified and when there is a clinical suspicion of a proximal disease (Pfenninger & Zainea, 2001).

It has been suggested that surgery is the most definitive management for most perianal disorders with minimum recurrence (Sharma et al., 2017). Commonly employed

surgical procedures in the studies were: Hemorrhoidectomy (ligature/closed/open) for hemorrhoids; Lateral Internal Anal Sphincterotomy and Anal Dilation for fissure-in-ano; Fistulectomy, fistulotomy and Seton for fistula-in-ano (Mohammed et al., 2016). The results (surgical outcomes) obtained by the aforementioned studies have been reported to be satisfactory, with no mortality. An article review has compared the outcomes of medical and surgical treatments for chronic anal fissure; it has reported that the complete pain relief varies between 64% to 92.5% with medical treatment, whereas 96% to 100% with surgical treatment, over a period of 6-8 weeks of follow-up. The fissure healing rates for chronic anal fissures ranged from 72% to 92.5% with the medical treatment, whereas 93% to 100% with the surgical treatment (Irkal and Basava, 2019). The article review concluded that there is statistically significant better pain relief and fissure healing rate with surgical treatment, compared to the medical treatment (Irkal and Basava, 2019). Among the medical treatment with topical agents, diltiazem has been preferred over glyceryltrinitrate; diltiazem has shown latency in clearance of symptoms and lesion, but it has good healing rates, faster pain relief and minimal complications/adverse effects (Gosala et al., 2017). Medical treatment can be considered as a safe first-choice treatment, but it is associated with high failure (or recurrence) rate (Irkal and Basava, 2019). A review and network meta-analysis of randomized controlled trials (RCTs) regarding the surgical and medical treatments of chronic anal fissures has been performed by Ebinger et al. It has concluded that lateral internal sphincterotomy is most efficacious treatment for chronic anal fissures, with highest healing rates and lowest failure rates; however, it is associated with certain self-limiting complications like perianal hematoma or post-operative anal incontinence in about 9% of cases (Ebinger et al., 2017).

Botulinum toxin (BTX) injection is a minimally invasive treatment option for chronic anal fissures when the conservative management fails. It is known to act by blocking the acetylcholine release leading to short-term paralysis of internal anal sphincter muscles and thereby reducing the anal tone. The effectiveness of BTX injection in treating CAF has been studied. Meta-analysis has reported varying efficiency ranging from 33% to 96% when chronic anal fissures were treated with botulinum toxin injections over the internal sphincter, causing reversible ‘chemical sphincterotomy’. The resolution time varies from 1 to 8 weeks.

However, it was associated with transient fecal incontinence in about 5% of cases (Bobkiewicz et al., 2016). It has been concluded that despite being safe and effective minimally invasive treatment for chronic anal fissures, it is associated with significant long-term treatment failure.

A controlled prospective trial involving 100 patients has compared the cure rates, post-operative complications and cost-effectiveness between anal dilatation (AD) and Lateral Anal Sphincterotomy (LAS) in chronic anal fissures (CAF) (Agarwal et al., 2015). During the follow-up of 6 weeks, complete recovery was reported in 92% AD and 90% LAS groups. There was significant reduction in anal pain and symptomatic relief with AD, which was equivalent to LAS. There was slightly better symptomatic improvement with AD compared to LAS; AD being a less invasive method for CAF. AD had not shown any complications like incontinence or sphincter injuries (Agarwal et al., 2015). Various other studies have compared the standard lateral anal sphincterotomy with anal dilatation with mixed results, and suggested bigger studies for further evaluation of anal dilatation. High cure rates (>90%) have been observed for both anal dilatation as well as lateral anal sphincterotomy (Agarwal et al., 2015; Rakesh Kumar Pandit & Vinay Kumar Jha, 2019). Both the methods have shown equivalent efficacy and safety, associated with early pain relief, high ulcer healing rate, and overall symptomatic improvement (Rakesh Kumar Pandit & Vinay Kumar Jha, 2019). The post-operative symptoms, complications, and recurrence rates of both the procedures are comparable. Furthermore, there are no reported incidences of major anal incontinence or sphincter damage with both of these procedures (Dr. Arunkumar Uttam & Dr. Pramoda Sangolagi, 2018). These studies reasonably justify the preference of anal dilatation over lateral anal sphincterotomy in our study. However, anal dilatation has been associated with minor complications including minor bleeding, infection, minor (or transient) incontinence, perianal hematoma, and recurrence. The recurrence rates reported with anal dilatation varies between 5% and 16% (Dr. Arunkumar Uttam & Dr. Pramoda Sangolagi, 2018; Rakesh Kumar Pandit & Vinay Kumar Jha, 2019; Shukla et al., 2019). While our study reveals a recurrence rate of 1.11% with anal dilatation. Anal irritation or discomfort was the commonest problem noted after anal dilatation. However, it has been controlled with analgesics and local application of steroid creams. Certain

incidences of post-operative bleeding have been controlled by administering hemocoagulase and/or tranexamic acid.

Meta-analytic studies have revealed that stapled hemorrhoidopexy and ligasure hemorrhoidectomy showed practically comparable outcomes (Lohsiriwat, 2015). Stapled hemorrhoidopexy must be reserved for patients with circumferential prolapsing hemorrhoids, and it must be performed by a well-trained surgeon (Lohsiriwat, 2015). Plication of hemorrhoids (also known as "ligation anopexy/mucopexy") is a non-excisional operation for hemorrhoids, which may be used in conjunction with Doppler-guided hemorrhoidal artery ligation (DG-HAL) (Lohsiriwat, 2015). Ligation anopexy/mucopexy has been considered as a good alternative to excisional hemorrhoidectomy for grade II/III hemorrhoids, as it has shorter operative time and lesser post-operative pain (Elshazly et al., 2014; Lohsiriwat, 2015). However, there is a possibility of revascularization and recurrent prolapse on the long-term. DG-HAL has shown a recurrence rate of 10% for prolapse and bleeding, when used in the treatment of grade II/II hemorrhoids (Giordano et al., 2009). Excisional hemorrhoidectomy has been considered as a mainstay operation for grade III/IV hemorrhoids as well as complicated hemorrhoids; open method (Milligan-Morgan) and closed method (Fergusson) hemorrhoidectomy have shown to be equally effective and safe (Lohsiriwat, 2015). Literature has reported complications with hemorrhoid surgeries, such as, bleeding, post-operative pain, acute urinary retention, infection, recurrence, anal stenosis, and incontinence (Picchio et al., 2014). The incidence of recurrence for conventional hemorrhoidectomy has been reported to vary between 0 to 10.8% according to various studies (Picchio et al., 2014). Our study has employed conventional hemorrhoidectomy for treatment of grades II, III, and IV hemorrhoids with successful and satisfactory outcomes, and a recurrence rate of 1.43%. We have also employed ligation of piles (ligation mucopexy) for treating selected cases with grade II hemorrhoids; the outcomes were found to be reasonable and the post-operative recovery was quicker than conventional hemorrhoidectomy. We are of the opinion that ligation mucopexy (pedicle ligation of piles) is better than rubber band ligation because the rubber band may get slipped whereas the suture ligatures don't slip easily.

Although not a life-threatening condition, fistula-in-ano often has a significant impact on the patient's quality of life. The treatment of fistula-in-ano primarily emphasizes on destroying the tract along with preserving of the anal sphincter mechanism (Carr & Velasco, 2021). The greatest risk of surgical treatment for fistula-in-ano is the damage to the external anal sphincter which could lead to anal incontinence. Hence, pre-operative assessment and documentation of the sphincter tone and the continence status is advisable (Carr & Velasco, 2021). The potentially life-changing outcomes of fistula surgery include anal stenosis, fecal incontinence, and fistula recurrence (Carr & Velasco, 2021). Recurrence is usually noted in one year following surgery; recurrence rates ranges between 3-57% depending upon the type of fistula and the surgical option employed (Carr & Velasco, 2021; Mei et al., 2019). We have employed fistulectomy in our study which has shown a minimal recurrence rate of 5.26%. While dissecting the fistula tract, Mayo's scissors is used in such a way that the convex surface of the scissor blades faces the fistula; this facilitates excision of intact fistula in-toto. The post-operative complications have only occasionally been observed, including infection, delayed wound healing, and transient fecal incontinence.

We would like to emphasize on a point which we have come across our experience; external sphincter is the main culprit in fissure-in-ano, whereas internal sphincter is the main culprit in the deep-seated anorectal pathology, such as ischiorectal abscess, high fistula-in-ano, and long-standing hemorrhoids. Internal sphincter spasm is not related to the fissure-in-ano pathology at all, but it is rather the external sphincterospasm which plays a vital role in the anal fissures and contributes to the increased anal canal pressure. This voluntary external sphincter spasm is caused as a reflex action due to the persistent anal pain. We have observed internal sphincterospasm in deep rectal/ischiorectal abscess and fistulas, and therefore employed anal dilatation as an adjuvant to the relevant surgical treatment (I & D, fistulectomy). Furthermore, we have observed hypertrophic external sphincter in long-standing hemorrhoids; hence anal dilatation has been an integral part of the surgical hemorrhoidectomy that we perform.

There have been instances of rare organic anorectal disorders like colorectal intussusception, anorectal melanoma, and solitary rectal ulcer syndrome (SRUS) which have

been managed accordingly; these have not been included in the data because of statistical insignificance. Unusual presentations observed include: fistula-in-ano masquerading as a pilonidal sinus ("pilonidal fistula-in-ano"), colorectal intussusception masquerading as a rectal prolapse, anorectal malignant melanoma masquerading as a perianal abscess, rectal prolapse associated with SRUS, rectal hemangioma presenting as a soft bulge masquerading as a rectal abscess, etc. Such cases posed a diagnostic dilemma and difficulty in management. Rectal prolapse (or intussusception) may be associated with solitary rectal ulcer syndrome (SRUS). It is often located anteriorly and diagnosed by sigmoidoscopy. One such case has been managed in our setup by perineal surgery, i.e., circumferential resection of rectal mucosa with ulcer, followed by creation of 'neoanus' with a satisfactory post-operative outcome. Solitary rectal ulcer syndrome (SRUS) is a chronic benign anorectal condition among young adults, often associated with straining or abnormal defecation. Step-wise individualized approach has been advocated in its management; SRUS associated with external prolapse can be managed by mucosal resection or perineal proctectomy. Some cases of anorectal malignancy have also been managed in our hospital; we have treated them with abdomino-perineal resection (APR) with colo-perianal anastomosis creating a "neoanus". This neoanus, besides having reduced sphincter control, was preferable in patients who desired to pass stools through the bottom without having a colostomy.

Strengths & Limitations of the study: The main strength of our study is the total number of subjects (patients) included, which is probably the highest among the studies conducted in the field of coloproctology. The limitation of this study is that it is a retrospective observational study (descriptive research design), with no comparative analysis of the surgical modalities. Observational research in the form of a descriptive or a qualitative study resides at the bottom of the evidence pyramid (*LibGuides: Evidence-Based Practice: Levels of Evidence and Study Designs*, 2022). Although our study is a single-center descriptive study (level VI), the discussion with the other existing anorectal studies add to our findings such that it might as well be considered as a systematic review of the descriptive qualitative studies (meta-synthesis - level V). Hence, prospective and experimental studies, such as RCTs related to the anorectal disorders are encouraged to promote higher levels of evidence.

Our study can be potentially considered as a skeletal framework or baseline platform for the development of higher level research studies. Being a high volume center for anorectal disorders, our hospital has a scope for further experimental studies in the field of coloproctology.

SUMMARY

Anorectal disorders usually affect the age group of 15 to 50 years, with majority of the patients in their third to fifth decade. With more than two-thirds of patients being males, there is a male predominance. This could be due to introversion of female patients, and higher medical attendance of male patients. The commonly associated predisposing factors for anorectal disorders include: constipation, pregnancy, poor perianal hygiene, lack of physical activity (exercise), low fiber diet, and mixed (or non-vegetarian) diet. The commonly encountered anorectal symptoms include anal pain with bleeding per rectum, difficulty in passing stools, mass per anum and pruritus (Basava & Irkal, 2019). Our study has included 5345 cases with anorectal disorders, with males (55.47%) marginally higher than females (44.53%); thus male predominance was observed with male: female ratio of 1.24: 1. The most commonly affected age group was 20-40 years, followed by 40-60 years, suggesting that anorectal conditions commonly affects the middle-aged productive population. The two most prominent risk factors for anorectal disorders in our study were: constipation and pregnancy. However, the other risk factors have not been studied. The common anorectal symptoms in the decreasing order of frequency were: anal pain (painful defecation), bleeding per rectum, burning sensation in anus, mass per anus, pus discharge, and swelling around the anus. These symptoms correspond to the commonly encountered anorectal disorders.

According to an article review, the distribution of anorectal cases varies among different studies; the commonly diagnosed anorectal conditions are hemorrhoids (34-62%), fissure-in-ano (14-36%), fistula-in-ano, and pruritus ani (Basava & Irkal, 2019). In our study, the commonly diagnosed anorectal disorders in the decreasing order of frequency were: anal fissures (3996 cases, 74.76%), fissures with proctitis/piles (444 cases; 8.31%), fissures with sentinel piles (220 cases; 4.11%), hemorrhoids (209 cases; 3.91%), fistula-in-ano (152 cases; 2.84%), anorectal abscesses (140 cases; 2.63%), thrombotic external piles (101 cases; 1.89%), anorectal malignancy (50 cases; 0.93%), rectal polyp (24 cases; 0.45%), and rectal prolapse (9 cases; 0.17%). This observation of case distribution in our study

implies that a major chunk of about 94% of anorectal disorders comprise of the three common conditions: fissure-in-ano, hemorrhoids, and fistula-in-ano. One contrasting feature of our study results is that fissure-in-ano is found to be the commonest anorectal condition. It is emphasized that the incidence of anorectal malignancy was 0.93%, which is comparable to other studies.

The benign anorectal disorders are highly prevalent in the primary care settings, although there is often a lack of evidence of effective therapy (Fargo & Latimer, 2012). Our study is comparable to most of the aforementioned studies, with similar demographic profile, symptomatology, proportion of anorectal disorders, and incidence of anorectal malignancy. The findings are comparable with other studies, like male preponderance, commonly affected age group 20-40 years, and common risk factor as constipation.

It has been suggested that surgery is the most definitive management for most perianal disorders with minimum recurrence (Sharma et al., 2017). Commonly employed surgical procedures in the studies were: Hemorrhoidectomy (ligature/closed/open) for hemorrhoids; Lateral Internal Anal Sphincterotomy and Anal Dilation for fissure-in-ano; Fistulectomy, fistulotomy and Seton for fistula-in-ano (Mohammed et al., 2016). The results (surgical outcomes) obtained by the aforementioned studies have been reported to be satisfactory, with no mortality. We have employed novel surgical techniques for treatment of anorectal disorders as follows:

- Anal dilatation with/without excision of sentinel piles
- Hemorrhoidectomy, including open and stapler procedures
- Fistulectomy
- Incision and drainage (I & D) of abscess
- Excision of thrombotic external piles
- Biopsy of suspicious anorectal growths
- Transanal excision of rectal polyps
- Thiersch stitching of rectal prolapse

It is noteworthy that some patients with generalized debility had fecal impaction; such cases were subjected to proctoclysis and manual fecal evacuation following anal dilatation.

Recurrence of disease was noted at 1 year of follow-up. Some patients had minor symptoms of anal irritation and minimal bleeding per rectum during short-term follow-up after anal dilatation for fissure-in-ano. Those who underwent other operative procedures also developed post-operative pain and bleeding; pain was controlled with appropriate analgesics while bleeding was often controlled with local compression for a few minutes. Most of the patients were discharged uneventfully. Immediate post-operative complications like pain and bleeding have been observed in many patents as a usual post-operative outcome. However, we did not encounter any long-term complications like major anal incontinence or sphincter injuries with any of our surgical procedures. The outcomes of our procedures were satisfactory with no mortality reported.

It is noteworthy that in our experience, one in every three cases of high fistula-in-ano had no internal opening and ended blindly into the ischiorectal fossa during intraoperative exploration; this suggests the possible origin of high anal fistulas from the ischiorectal fossa, rather than cryptoglandular involvement. Moreover, most of such high anal fistulas were found to extend very high at the level of levator ani muscles. Dissection is difficult in such cases and many a times stops in the middle leading to a high recurrence rate. We may suggest that an ideal way of surgery is to follow through the fistula tract only, which minimizes the disturbance and destruction of surrounding sphincter fibers. The lesser the damage to the sphincter fibers, the lesser is the possibility of anal incontinence.

The recurrence rates have been studied for the three commonly performed procedures in our setup, i.e. anal dilatation, hemorrhoidectomy, and fistulectomy. About 52 cases of fissure-in-ano who underwent anal dilatation (modified Lord's procedure) showed a recurrence of disease at 1 year, i.e. recurrence rate of 1.11% has been noted with anal dilatation procedure. Among 209 cases of hemorrhoids treated with hemorrhoidectomy, 3 cases showed recurrence at long-term follow-up, i.e. recurrence rate of 1.43% has been

noted with hemorrhoidectomy. Among 152 cases of fistula-in-ano treated with fistulectomy, 8 cases showed recurrence at long-term follow-up, i.e. recurrence rate of 5.26% has been noted with fistulectomy.

As an experiential knowledge, we can assert that the external sphincter is the main culprit in fissure-in-ano, whereas the internal sphincter is the main culprit in the long standing hemorrhoids and deeper ischiorectal abscesses and high anal fistulas. The spasm of the external sphincter is caused voluntarily as a response to the underlying anal pain due to fissure-in-ano. Hence the increased anal canal pressure found in fissure-in-ano is probably due to the external sphincterospasm and not due to the internal sphincterospasm at all. The internal sphincterospasm often tends to occur only if the pathologies extend above the dentate line, as in internal hemorrhoids and deeper ischiorectal abscesses/fistulae. With this justification, we have employed anal dilatation as an integral part of surgeries in the fissures, fistulas and hemorrhoids for better surgical outcomes. Anal dilatation reasonably tackles the sphincterospasm of both the internal and external anal sphincters, and the procedure has also been referred to as “sphincteroclysis”.

CONCLUSION

Anorectal disorders are very common conditions affecting general population with a male preponderance. They commonly affect the age group of 20-40 years (middle-aged). Although they can present with a myriad of symptoms, the commonest presenting symptoms are painful defecation, bleeding per rectum, and burning sensation in the anal region. Constipation and pregnancy are the predominant risk factors. The most commonly diagnosed anorectal conditions are anal fissures (commonest among others), hemorrhoids and fistula-in-ano; these together comprise more than 90% of the anorectal disorders. The incidence of anorectal malignancy is 0.93%. Novel surgical procedures commonly employed in our set-up includes Anal Dilatation with/without excision of sentinel piles, hemorrhoidectomy (open and stapler procedures), and fistulectomy. The recurrence rates observed are minimal (1.11% with anal dilatation, 1.43% with hemorrhoidectomy, and 5.26% with fistulectomy). We have not encountered any long-term complications like major anal incontinence or sphincter injuries with any of our surgical procedures. The outcomes of our procedures were satisfactory with no mortality reported.

CONTRIBUTION TO KNOWLEDGE

The author shares the practical professional experiences, “nuggets” of surgical tips and techniques, and claims the following contributions to knowledge:

1. Anorectal disorders which are clinically exposed can be compared to the tip of an iceberg; i.e. there are many more patients who could be suffering from anorectal ailments without seeking medical attention. Most of the existing studies about anorectal disorders have included limited number of subjects. There is a definite scope for performing studies about anorectal disorders on a larger population scale for better evaluations, management methodologies, and outcomes. Our study can be claimed as a unique observational study with the highest number of anorectal patients ever included. Hence, the implications and knowledge shared by our study can be standardized and applied universally for the management of anorectal disorders.

2. The prevalence of benign anorectal disorders is high in the primary care settings, although there is often a lack of evidence of effective therapy. The surgical managements for anorectal disorders practiced in our study have shown to be safe and effective with satisfactory short-term and long-term outcomes. Considering the patient satisfaction as the prime factor for determining the efficacy of surgery, the novel surgical methods employed in our study can be potentially standardized and applicable under all circumstances.

3. One commonly encountered condition in the OPD was pruritus ani, most often due to obvious fungal infection of perianal region (tinea cruris). It is managed by antifungal agents, antihistamines, and keeping the perineal region dry and hygienic. Perianal fungal infection is a common problem associated with piles/fissures. This

implies poor perineal hygiene among the general public. The patients must be encouraged to maintain proper perineal hygiene. Drying the perineum using a table fan helps to reduce the moisture and prevent fungal infection.

4. “Proctitis” (or anusitis) may be sometimes be considered as an initial manifestation of anal fissure or piles. If left untreated, it may further lead to piles or fissure. Hence, anal dilatation can also be performed in long-standing proctitis or those wherein medical management has failed.

5. Our study has identified anal fissures as the commonest anorectal condition. Larger prospective RCTs may be suggested to further evaluate the application of anal dilatation procedure in anal fissures. We have safely and effectively employed anal dilatation, because it has an advantage of being less invasive. Our study has made substantial evidence-based contribution supporting the utilization of anal dilatation procedure. It has shown significantly favourable results. Anal dilatation can potentially replace lateral anal sphincterotomy as a gold standard procedure in chronic anal fissures.

6. A word of caution to be exercised would be that, strict anaesthetist monitoring is inevitable in performing surgical procedures under short GA. There have been instances of cardio-respiratory depression in case of improper anesthetic drug dosages, which were eventually resuscitated successfully. It is advised to follow strict anesthetic protocols, like nil by mouth for 4-6 hours before procedure, pre-operative medications, counselling, etc.

7. Spasm of both internal and external sphincters has been observed in chronic anal fissure. Treatment of chronic anal fissure must aim to reduce both the external and internal anal sphincter tone and thereby facilitate fissure healing. Anal dilatation

stretches and relaxes both internal as well as external sphincters; whereas lateral sphincterotomy only tackles the internal sphincter spasm. Internal sphincterotomy might not be sufficient to reduce anal canal pressure. This could be the possible reason for better efficacy of anal dilatation compared to lateral anal sphincterotomy in our study. Furthermore, it has been observed that in chronic anorectal diseases, there is considerable hypertrophy of external and internal sphincters. However, sphincterotomy is not necessary in such cases. In our experience with thousands of anorectal cases, we have come across hypertrophied internal anal sphincters associated with long-standing hemorrhoids; and hypertrophied external anal sphincters in chronic anal fissures. External sphincter hypertrophy could be due to prolonged voluntary spasm occurring due to anal pain. Hence, we can assert that internal anal sphincter is the main culprit for hemorrhoids, while external anal sphincter is the main culprit for anal fissures. Considering this background of sphincter involvement, controlled anal dilatation has been an integral part of almost all our surgical procedures (except in cases of anal incontinence and prolapse) as sphincterotomy is seldom required. We have inferred this viewpoint in one of our publications as "External anal sphincter is the main culprit in fissure-in-ano, whereas the internal anal sphincter may have a role in hemorrhoids and deeper pathologies. Internal sphincterotomy could not be the complete treatment for fissure-in-ano. Whereas Anal Dilatation tackles both the sphincters, including the external sphincter. Hence Anal Dilatation is deemed to be the treatment of choice for fissure-in-ano".

8. The general population seems to be reluctant to undergo surgery due to the fear of anal incontinence post-surgery. Awareness needs to be created regarding sphincter preservation as an integral part of surgical safety and efficacy. Operative injury to external sphincter is the main reason for post-operative incontinence. There is a stigma in general public that any perianal operation would lead to anal incontinence. This makes them refrain from surgery. Sphincter division is unnecessary and avoidable in perianal surgeries. Hence the patients must be reassured regarding preservation of sphincter and maintenance of anal continence.

9. It is important for the surgeon, to preserve the external sphincter mechanism during the anorectal surgeries. We hereby share some tips to perform hemorrhoidectomy procedure. The pile mass is delineated and held with an Allis forceps externally. Another Allis forceps is used to hold the pedicle and the pulsation of the hemorrhoidal artery is felt. First ligature is applied at the apex of the pedicle using an absorbable suture. The dissection of hemorrhoidal mass is began perianally; the skin is incised holding the knife flat because the external sphincter lies just beneath the skin. Care is taken not to cut the external sphincter. The dissection is carried out submucosally until the pedicle is reached. Then the second transfixing ligature is applied using absorbable suture. The hemorrhoid pedicle is amputated leaving 0.5 cm from the ligature to avoid bleeding from the pedicle. This technique is repeated at all the three sites of hemorrhoids (3, 7, and 11 O' clock). Perianal skin edges are loosely approximated. The mucosa is spared between the locations of piles, to prevent anal stenosis in future. We never put the gauze dressings for controlling the bleeding because removal of the gauze is more painful later.

10. Sentinel piles located at 3, 7, and 11 O' clock positions are often having pedicles connecting with internal hemorrhoids. Such pile masses can be ligated at the pedicles before excising; this prevents excessive bleeding. In case of minor excisions (sentinel piles, thrombotic piles, low anal fistulas), the bleeding can be controlled by local compression (for about 3 minutes) and apposition of the gluteal region over the wound. Hemostatic plugs (like abgel) have been used in certain cases. However, suturing is seldom required, and the anal wounds are preferably kept open for healing with secondary intention.

11. Stapler hemorrhoidopexy has been done in selected cases with satisfactory post-operative outcomes. This procedure can be preferred in patients with internal hemorrhoids (2^{nd} or 3^{rd} degree) including circumferential hemorrhoids, without any

significant external hemorrhoids. This avoids an anal wound and hastens the post-operative recovery. However, the long-term outcomes such as anal discomfort, narrowing of anal canal, and recurrence need to be evaluated and compared with that of open hemorrhoidectomy.

12. Open ligation (ligation mucopexy) of second degree hemorrhoids have been done in selected cases with satisfactory outcomes. Although Rubber band ligation is commonly done procedure, open ligation can be relatively simpler technique with minimal technical assistance. There is a scope for comparative studies between open ligation and rubber band ligation in second degree piles.

13. While dissecting the fistula tract, Mayo's scissors is used in a way that the convex surface of the scissor blades faces the fistula; this facilitates excision of intact fistula in-toto.

14. In our hospital setup, we do not have radiological imaging facilities. We often refer the patients to a local imaging centre for radiological investigations like CT scan, MRI, and Transrectal ultrasonography. There seems to be some differences in the interpretation of the positioning of anal canal (3, 6, 9 and 12 O' clock) between the surgeons and the radiologists. This needs to be sorted out for smoother diagnosis and management.

15. Abdominoperineal resection (APR) for anorectal neoplasm can be modified to avoid permanent colostomy. After a pull-through, the colon can be brought down in the perineum to create a "neoanus" by performing a colo-perianal anastomosis. Thereby, the patient satisfaction and outcomes are better compared to colostomy.

16. An important aspect of perineal hygiene is to maintain adequate ventilation of the perianal or perineal area. Sometimes there is a suffocation of the perianal region is people who sit a lot, such as drivers and computer operators. This makes them prone for perianal infections and other anorectal disorders. Such people may keep the perianal region exposed to a table fan for some time to keep it dry and well-ventilated.

17. We have witnessed something called as “lockdown proctosis” during the COVID-19 pandemic. Due to a lack of physical activity, sedentary working style (work from home) and consumption of certain herbal medicines, there were unusual surge in OPD cases presenting with anorectal symptoms, which has been collectively referred to as “lockdown proctosis”.

18. Our hospital has served as a tertiary referral centre for various anorectal disorders, and can be rightfully deemed as a ‘pioneer institute for anorectal diseases’. Various patients who had undergone treatments from their local doctors, such as ayurvedic treatments (like kshaarsutra), homeopathic treatments, alternative medicine, localized perianal injections, etc. have ultimately turned up or referred to our hospital due to their persistent problems. Another point worth mentioning is that there has been an increasing trend in the number of patients treated annually, except during the period of COVID-19 outbreak and lockdown. However, our services were never shut-off throughout the COVID-19 pandemic and we have continuously served the people for their anorectal conditions with compassion and due precautions (social distancing, compulsory masks, hand-sanitizers, and surgical precautions).

SUGGESTION FOR FUTURE RESEARCH

After the research over this study **"Pattern of Anorectal Disorders and their Management at a Private Health Center in South India"**, it is suggested that in future:

- The methodology can be implemented with advancement. As per our knowledge, our observational study possibly consists of largest number of subjects with anorectal disorders, ever studied. The groundwork or foundation laid by our study is commendable and it bridges the gaps in the existing knowledge about anorectal disorders. Our study can potentially serve as a reliable baseline (platform) for several higher studies like prospective RCTs related to anorectal disorders.

- New processes can be implemented. We have used commonly-performed, novel surgical procedures for treating anorectal disorders. Further studies regarding utilization of advanced surgical modalities, including stapler hemorrhoidopexy, ligasure hemorrhoidectomy, laser techniques, etc may be performed. Comparative prospective/retrospective studies between open and stapler hemorrhoidectomy may be encouraged and newer specific guidelines can be developed.

- Larger prospective RCTs may be suggested to further evaluate the application of anal dilatation procedure. Standard surgical management of anal fissures can be revised by considering modified Lord's anal dilatation as a preferred "gold standard" treatment, displacing the lateral anal sphincterotomy. Further comparative analytic studies between these standard procedures are encouraged considering the use of standardized modified 'controlled' anal dilatation in the setting of anal fissures. The original Lord's procedure (forceful stretching using 8 fingers) can be condemned forever.

- Rare anorectal conditions which we have come across are: anorectal tuberculosis, inflammatory bowel disease (Crohn's disease and ulcerative colitis), colorectal intussusception, and anorectal malignancies. Adult colorectal intussusception secondary to a benign lesion (like lipoma) at lead point can be managed by simple excision of lesion; following which the intussusceptions reduces spontaneously. Abdominoperineal resection (APR) has been done with creation of "neoanus" in the perineum, in order to avoid a colostomy. This "neoanus" is created by pull-through of the proximal sigmoid colon end into the pelvic floor and anastomosing into the edges of perineal wound.

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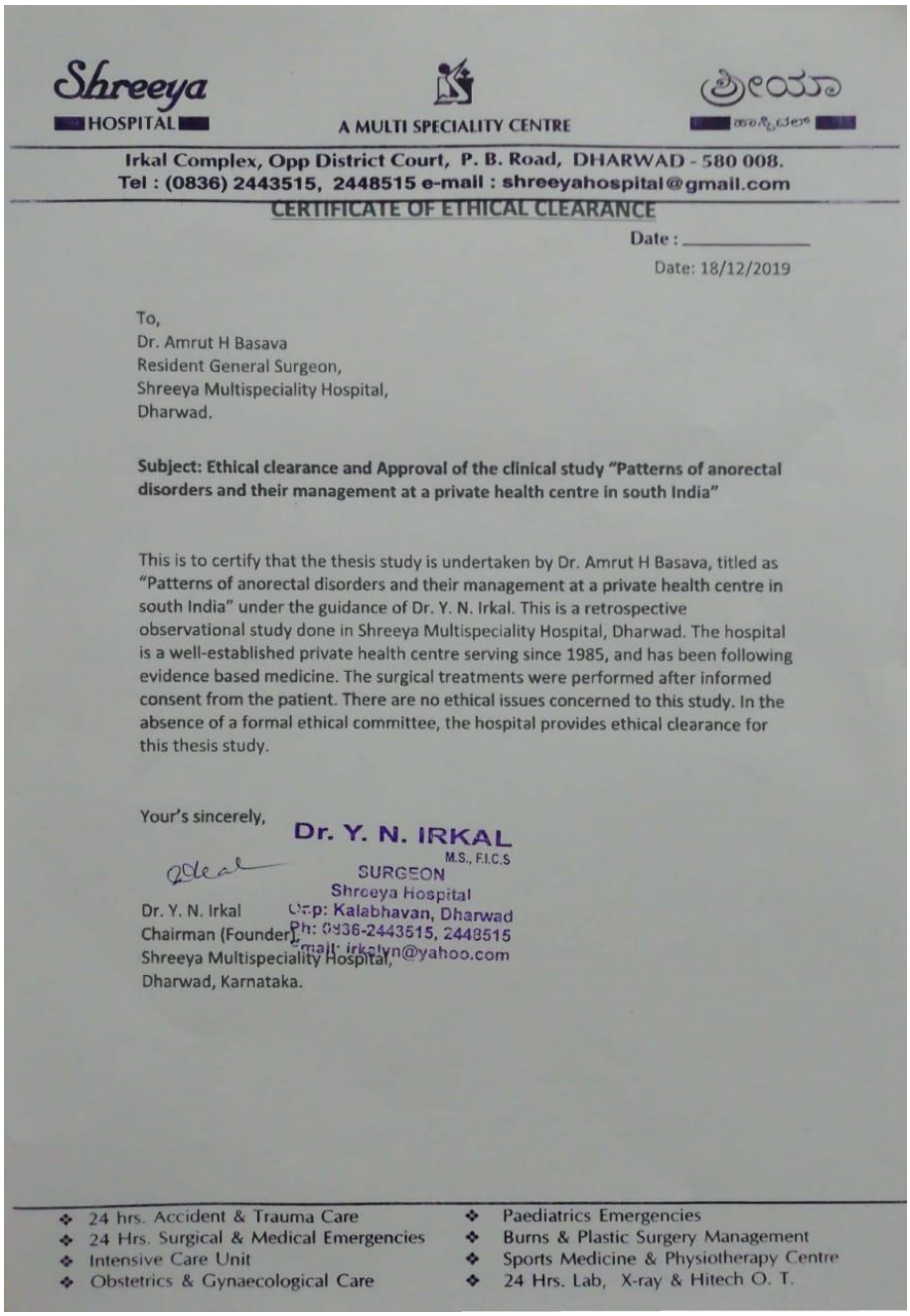
APPENDIX

APPENDIX A: Ethical clearance certificate from the institution



Shreeya HOSPITAL

A MULTI SPECIALITY CENTRE

ಶ್ರೀಯಾ ಹಾಸ್ಪಿಟಲ್

Irkal Complex, Opp District Court, P. B. Road, DHARWAD - 580 008.
Tel : (0836) 2443515, 2448515 e-mail : shreeyahospital@gmail.com

CERTIFICATE OF ETHICAL CLEARANCE

Date : _____

Date: 18/12/2019

To,
Dr. Amrut H Basava
Resident General Surgeon,
Shreeya Multispeciality Hospital,
Dharwad.

Subject: Ethical clearance and Approval of the clinical study "Patterns of anorectal disorders and their management at a private health centre in south India"

This is to certify that the thesis study is undertaken by Dr. Amrut H Basava, titled as "Patterns of anorectal disorders and their management at a private health centre in south India" under the guidance of Dr. Y. N. Irkal. This is a retrospective observational study done in Shreeya Multispeciality Hospital, Dharwad. The hospital is a well-established private health centre serving since 1985, and has been following evidence based medicine. The surgical treatments were performed after informed consent from the patient. There are no ethical issues concerned to this study. In the absence of a formal ethical committee, the hospital provides ethical clearance for this thesis study.

Your's sincerely,

Dr. Y. N. IRKAL
M.S., F.I.C.S
SURGEON
Shreeya Hospital
Opp: Kalabhavan, Dharwad
Ph: 0836-2443515, 2448515
E-mail: irkalyn@yahoo.com

Dr. Y. N. Irkal
Chairman (Founder),
Shreeya Multispeciality Hospital,
Dharwad, Karnataka.

- 24 hrs. Accident & Trauma Care
- 24 Hrs. Surgical & Medical Emergencies
- Intensive Care Unit
- Obstetrics & Gynaecological Care
- Paediatrics Emergencies
- Burns & Plastic Surgery Management
- Sports Medicine & Physiotherapy Centre
- 24 Hrs. Lab, X-ray & Hitech O. T.

APPENDIX B: Local Guide Approval Letter

CERTIFICATE TO BE FURNISHED BY THE GUIDE

I, Dr. Yallanasa. N. Irkal, working as senior surgeon at Shreeya Multispeciality Hospital, Dharwad agree to serve as Guide for Mr. Amrut. H. Basava for his Ph. D Research Programme.

His subject area will be anorectal diseases (coloproctology).

Signature of the Supervisor

With seal

Dr. Y. N. IRKAL
M.S., F.I.C.S
SURGEON
Shreeya Hospital
Opp: Kalabhavan, Dharwad
Ph: 0836-2443515, 2448515
Email: irkalyn@yahoo.com

DECLARATION CERTIFICATE

I / We do, hereby declare that the proposed Topic "Pattern of anorectal disorders and their management at a private health centre in South India" has not been done earlier for the award of Ph. D Degree in this or any other University

Signature of the Supervisor

With seal

Dr. Y. N. IRKAL
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APPENDIX C: Minor OT cases of anorectal disorders treated at Shreeya Hospital for the annual year 2018.

SHREEYA MULTISPECIALITY HOSPITAL, DHARWAD

MINOR OT CASES FOR THE ANNUAL YEAR 2018

MONTH	MALE							FEMALE							TOTAL
	Dilatation	I & D		Excision			Total	Dilatation	I & D		Excision			Total	
		PA	RA	LAF	TSP	SP			PA	RA	LAF	TSP	SP		
January	190	08	01	02	05	15	221	148	05	00	00	02	18	173	394
February	132	09	01	01	03	03	149	123	02	01	00	00	16	142	291
March	164	08	01	02	04	12	191	131	06	01	01	02	04	145	336
April	154	09	00	00	07	12	182	168	02	00	00	02	08	180	362
May	202	09	00	02	05	07	225	228	00	01	00	00	08	237	462
June	236	06	00	01	04	05	252	171	00	00	00	01	08	180	432
July	193	03	00	07	07	03	213	144	00	00	01	04	03	152	365
August	214	13	00	03	05	04	239	181	02	00	01	02	07	193	432
September	213	08	00	00	07	10	238	213	02	00	00	04	09	228	466
October	243	07	02	07	09	13	281	216	04	01	06	02	25	254	535
November	236	07	04	03	09	17	276	177	01	00	04	06	17	205	481
December	210	10	01	08	09	21	259	173	04	01	02	02	29	211	470
Total	**2387**	**97**	**10**	**36**	**74**	**122**	**2726**	**2073**	**28**	**05**	**15**	**27**	**152**	**2300**	**5026**

APPENDIX D: Major OT cases of anorectal disorders treated at Shreeya Hospital for the annual year 2018.

MAJOR OT CASES FOR THE ANNUAL YEAR 2018

MONTH	Hemorrhoidectomy			Fistulectomy			Thiersch Stitch			TOTAL
	M	F	Total	M	F	Total	M	F	Total	
January	16	3	19	2	0	2	2	0	2	23
February	7	2	9	8	1	9	0	0	0	18
March	9	5	14	2	0	2	1	1	2	18
April	15	8	23	3	3	6	2	0	2	31
May	25	5	30	5	3	8	1	0	1	39
June	13	5	18	8	2	10	0	0	0	28
July	10	7	17	10	1	11	0	0	0	28
August	10	4	14	9	2	11	0	0	0	20
September	11	4	15	9	3	12	0	0	0	32
October	11	3	14	5	1	6	0	0	0	20
November	14	4	18	7	4	11	0	0	0	29
December	12	6	18	10	3	13	2	0	2	33
Total	153	56	**209**	78	23	**101**	8	1	**9**	**319**

APPENDIX D: Masterchart of cases with anorectal disorders included in the study

(File attached in the CD)

APPENDIX E: Keys to the Masterchart

(File attached in the CD)

APPENDIX F: Photographs of some anorectal disorders encountered in our practice.

3 cases of colorectal intussusception masquerading as a rectal prolapse.

A case of prolapsed hemorrhoids.

We are sharing some intraoperative photographs of open hemorrhoidectomy. The figure on the left shows prophylactic ligation of pedicle, which is performed at 3, 7, & 11 O' clock positions; this step prevents post-operative bleeding.

The figure on the right shows the skin lifted up from underneath and scalpel blade put flat on the perineum to avoid unnecessary dissection of the external sphincter. Subcutaneous dissection of hemorrhoidal mass facilitates sphincter identification and preservation during hemorrhoidectomy.

Hypertrophied external sphincters observed in two different cases of hemorrhoids

A case of chronic fissure-in-ano located posteriorly, with a sentinel skin tag evolving from the lower edge of the fissure.

A case of fistula-in-ano located posteriorly with the external opening at 5 O' clock position

A case of low anal fistula located posteriorly with the external opening is close to the anal region.

An intra-operative photograph of a huge lipoma as a lead point in a colo-rectal intussusception.

A rare case of anorectal malignant melanoma masquerading as a perianal abscess.

APPENDIX F: An overview of minor and major OT cases of anorectal disorders treated at Shreeya Hospital for the annual year 2019.

MINOR OT CASES FOR THE ANNUAL YEAR 2019

MONTH	MALE							FEMALE							TOTAL
	Dilatation	I & D		Excision			Total	Dilatation	I & D		Excision			Total	
		PA	RA	LAF	TSP	SP			PA	RA	LAF	TSP	SP		
January	202	12	03	05	09	21	252	165	01	01	04	03	27	201	453
February	155	13	03	08	09	08	196	113	06	00	01	03	30	153	349
March	199	11	02	11	09	28	260	150	02	00	03	04	33	192	452
April	206	13	05	09	00	33	266	168	02	02	03	00	44	219	485
May	230	10	07	10	06	48	311	162	06	01	03	07	91	270	581
June	215	09	03	03	15	39	284	126	02	03	01	06	57	195	479
July	266	17	03	23	12	62	383	158	05	00	04	07	72	246	629
August	184	16	02	06	06	61	275	110	01	01	02	08	75	197	472
September	208	07	03	09	12	51	290	147	03	00	03	04	87	244	534
October	208	07	01	09	09	63	297	165	02	00	05	15	88	275	572
November	198	15	03	16	11	56	299	146	01	01	05	09	68	230	529
December	220	10	02	22	10	70	334	153	03	03	03	07	86	255	589
Total	**2491**	**140**	**37**	**131**	**108**	**540**	**3447**	**1763**	**34**	**12**	**37**	**73**	**758**	**2677**	**6124**

MAJOR OT CASES FOR THE ANNUAL YEAR 2019

MONTH	Hemorrhoidectomy			Fistulectomy			Thiersch Stitch			TOTAL
	M	F	Total	M	F	Total	M	F	Total	
January	18	7	25	7	2	9	0	1	1	35
February	9	4	13	2	1	3	0	1	1	17
March	9	3	12	7	1	8	2	1	3	23
April	10	6	16	3	3	6	1	1	2	24
May	20	4	24	5	5	10	0	0	0	34
June	10	1	11	7	2	9	1	0	1	21
July	11	3	14	10	3	13	2	0	2	29
August	17	3	20	4	1	5	0	1	1	26
September	9	4	13	12	1	13	0	0	0	26
October	9	0	9	0	5	5	0	0	0	14
November	9	3	12	6	1	7	0	0	0	19
December	20	7	27	6	4	10	0	0	0	37
Total	151	45	**196**	69	29	**98**	6	5	**11**	**305**

A total of 6429 anorectal diseases have been managed in our hospital during the year 2019. Among them, 3673 (57.13%) were males and 2756 (42.86%) were females, with a male: female ratio of 1.33: 1. The common diagnoses included: fissure-in-ano (5286 cases – 82.22%), hemorrhoids (377 cases – 5.86%), fistula-in-ano (266 cases – 4.14%), perianal abscess (223 cases – 3.47%), thrombotic external piles (181 cases – 2.81%), rectal polyp (14 cases – 0.22%), and rectal prolapse (11 cases - 0.17%). Anorectal malignancy comprised of

1.1% of total anorectal cases (71cases). Surgical management included same protocols as the previous year (2018), which included: anal dilatation for fissure-in-ano, 1st & 2nd grade hemorrhoids; hemorrhoidectomy for 3rd & 4th grade hemorrhoids; fistulectomy for fistula-in-ano; incision & drainage for perianal abscesses; thrombectomy for thrombotic external piles; transanal polypectomy got rectal polyp, and Thiersch stitching for rectal prolapse.

By sharing this annual data of 2019, we intend to maintain consistently increasing trend in the total number of anorectal disorders treated in our hospital. This increasing trend has been noted, until the impact of the COVID-19 and the lockdown. After the pandemic, the increasing trend has been re-established. Our annual data of 2019 has been presented as a paper in ASICON 2020 which has fetched us reward and recognition from the national surgeons' association.

LIST OF PUBLICATIONS BASED ON THE THESIS

- Amrut Hirulal Basava, & Irkal, Y. N. (2019). Demography, Epidemiology, Clinical Presentations, Diagnoses and Management of Various Anorectal Diseases: An Article Review. *Journal of Universal Surgery*, *7*(3). https://www.jusurgery.com/universalsurgery/pdemography-epidemiology-clinical-presentations-diagnoses-and-management-of-various-anorectal-diseases-an-article-reviewp.php?aid=24760

- Dr. YN Irkal, Dr. Amrut Hirulal Basava. Comparative studies between medical and surgical treatments for chronic anal fissures: An article review. International Journal of Surgery and Surgical Research, Volume 1, Issue 1, 2019, Pages 16-18

- "Management of Chronic Anal Fissure by Botulinum Toxin Injection: An Article Review" is under process for publication in the Acta Scientific Clinical Case reports.

- "Comparison Between Anal Dilatation And Lateral Anal Sphincterotomy In The Management Of Chronic Anal Fissure: An Article Review" is under process for publication in the Medical and Research Publications (MAR case reports).