

Management Of Complex Posterior Horseshoe Anal Fistula By The Modified Hanley's Procedure -Clinical Experience And Review Of 25 Patients

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Abstract

This is a prospective study carried out with the aim of documenting clinical experience in the surgical management of posterior horseshoe fistula of cryptoglandular origin using the modified Hanley procedure as a one-stage procedure.

In this study, a modified Hanley procedure was used in 25 patients (20 males and 5 females) who had presented with posterior horseshoe anal fistula (mean age 41 years) for the period from February 2020 to December 2022, and the results of surgical outcomes were analyzed.

In this procedure, after optimization and anaesthesia, a malleable probe is inserted into the primary fistulous tract and directed towards the posterior anal space. A straight transverse incision is placed at the primary opening, towards the tip of the coccyx and posterior anal space. The anal portion of the fistulous tract is unroofed. The side fistula tracts are unroofed and removed in toto.

It is noted that complete healing was achieved in all 25 patients within a three-month postoperative period. Recurrence was found in only three patients after a six-month follow-up period. All patients were discharged on the 5th post-operative day. None required readmission, and post-operative pain was mild and bearable. Narcotic analgesics were not needed after discharge. After undergoing the procedure, the patients fully recovered, and within 2-3 weeks, all patients were able to return to their work and daily activities.

In conclusion, the posterior complex horseshoe anal fistula, though it has a treacherous fistulous tract, can be safely and successfully treated using the modified Hanley's procedure.

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I. Introduction:

An anorectal fistula is an abnormal communication lined with granulation tissue between the surface of the anal canal internally and the perianal skin or perineum externally¹. Secondary tracts may be multiple and can extend from the same primary opening. There are a few conditions, that have sinuses but do not have internal communication with the anal canal, and they should be differentiated :

- Hidradenitis suppurativa
- Infected inclusion cysts
- Pilonidal disease
- Bartholin gland abscess in females

Most often, it is the sequel of the perianal anal abscess, a spontaneous internal rupture, or an inadvertent therapeutic intervention. When the perianal fistulous communication is established, it will cause continuous discharge or wetting of the area, resulting in significant implications and impacts on the quality of life and effective working patterns. The perianal fistula causes social and hygienic embarrassment and also imparts continuous mild to moderate pain and discomfort. In a few individuals, especially those who have associated comorbidities and immunocompromise, it can result in frank sepsis or septicemia².

The pre-emptive diagnosis and appropriate management of the perianal fistula remain an enigma due to the plethora of procedural methods imparted from the ancient era to the sophisticated and complicated yet controversial modern methods in colorectal surgery. Predominantly surgical methods are considered the prime and mainstay of therapy with the objective of adequate draining of the local infective materials, resulting in the eradication of the fistulous tract and the preservation of the effective sphincter mechanism^{2,3}.

The choice of surgical approach depends on several factors, such as the age, sex, aetiology, location, type, and duration of the fistula, the expertise of the surgeon, previously performed procedures, and preoperative sphincter function⁴.

As over 90% result from a crypto glandular abscess originating from the crypts of Morgagni, which are located between the anal orifice and the dentate line, and most internal openings of the fistula are located around the anal glands surrounding the dentate line, they are referred to as anal in origin or low type, while fistula that originates above the dentate line is referred to as high type fistula⁵.

The anorectal fistula are classified and grouped based on the pathway of the fistulous tract and the structures they pass through before they exit in the perianal region as⁵

- Inter sphincteric (45%)
- Trans sphincteric (30%)
- Supra sphincteric (20%)
- Extra sphincteric (5%)

Most often, the perianal fistula proceeds after the drainage procedure applied for draining the perianal abscess. Perianal drainage, though it helps in the drainage of the pus and thereby reduces the inflammatory process, puts the patient at enhanced risk of either developing recurrent perianal sepsis or a perianal fistula. As per the statistics by Gordon et al., in nearly 35–50% of patients, perianal fistula occurs after the first episode of the perianal abscess⁶.

History of Perianal Fistula:

References to fistula-in-ano date to antiquity. Numerous publications and treaties on fistula in Ano and its fascination have existed for more than 2000 years. In 430 BCE, Hippocrates made extensive reference to surgical therapy for the fistulous disease, which is still practised, and he was credited as the first person to advocate the effective use of a seton (Latin *seta* "bristle").

John Arderne (1307–1399), a prolific English surgeon in 1376, wrote *Treatises of Fistula in Ano; Haemorrhoids, and Clysters*, which had the full description of the fistulotomy procedure and also mentioned the seton use. Historical references indicate that Louis XIV was treated for an anal fistula in the 18th century. Salmon established a hospital in London (St. Mark's) devoted to the treatment of fistula-in-ano and other rectal conditions.

In the late 19th and early 20th centuries, prominent physicians/surgeons, such as Goodsall and Miles, Milligan and Morgan, Thompson, and Lockhart-Mummery, made substantial contributions to the treatment of anal fistula. Based on their findings and observations, various theories on pathogenesis, progression, and treatment options were described. However, in these early years, in spite of the publication, there were only a few changes in the anatomical knowledge, pathogenesis, and natural progression of the disease.

Parks refined the classification system in 1976, which is still in widespread use. Over the past few decades, many authors have presented new techniques and case series in an effort to minimize recurrence rates and incontinence complications. In spite of these and with more than two millennia of rich knowledge and experience, fistula-in-ano remains a mystifying surgical disease.

Pathogenesis of Anorectal Fistula:

Fistula-in-ano is predominantly the sequel of a previously occurring anorectal abscess. In the dentate line of the anal canal, there are about 8–10 anal cryptoglandular structures, which are arranged in a circumferential pattern. Normally, these cryptoglandular structures pierce and penetrate through the internal sphincter, and as a result, they will reach the intersphincteric plane. This is important as these areas of penetration will pave the way for the infective organism from the anal canal to reach the intramuscular spaces. The hypothesis based on the cryptoglandular theory postulates that an infection that normally begins in the anal canal glands can penetrate into the muscular wall of the anal sphincters and lead to the formation of an anorectal abscess.

When these abscesses are dealt with through incision drainage or when they spontaneously rupture and drain, the left-over granulation tissue will persist and lead to the recurrence of the symptoms.

The incidence of the formation of this granulation tissue, resulting in the development of the fistula tract, shall vary from 7 to 40%.

Fistula in ano can develop as a consequence of trauma (e.g., rectoanal foreign bodies), inflammatory bowel diseases like Crohn's disease, acute and chronic anal fissures, colorectal carcinoma, following radiation proctitis, systemic infections like actinomycoses, tuberculosis, and lymphogranuloma venereum secondary to chlamydial infection.

Malouf et al⁸ have explained this pathogenesis as the infection and abscess of the crypt gland in the intersphincteric space spreading vertically, horizontally, or circumferentially, and this determines the site of the fistula. When circumferential spread occurs, through the intersphincteric, ischiorectal, or supraleveator compartment, it results in a horseshoe fistula. When the abscess is not drained adequately, either surgically or spontaneously, it spreads extensively into the ischiorectal space. This spread results in anterior and posterior horseshoe abscesses and fistulas.

Horseshoe fistula:

Horseshoe fistula is a complex type of trans-sphincteric fistula that is caused by an infection in the perianal gland in the midline posteriorly. This infection can extend along the deep postanal space to reach the ischiorectal fossa on one or both sides of the anal canal before it drains into the perianal skin. A perianal fistula is termed a "horseshoe fistula when the fistula's tract encircles the anus partially and exits out on either side of the anus⁶

Because of the depth and complexity of the secondary tracks associated with horseshoe fistula, symptoms are usually severe, and the diagnosis can be difficult.

The horseshoe fistula occurs more in males, and the average incident male-to-female ratio is 1.8:1.

The Horseshoe fistula is of two main types⁷

- Anterior type: less common, it originates from the anterior sub-epithelial space.
- Posterior type: the most common one and originates from the postanal space

Contrary to the general belief that the horseshoe fistula is the cause of the posterior deep anal abscess, the fistula follows the development of a deep postanal space abscess as its complication.

They are a particularly aggressive form of anorectal abscess and fistula because there is an erratic pattern of spread in a ring-like fashion to the deep post-anal space or rarely to the deep preanal space and then to the ischiorectal space. Therefore, the typical horseshoe fistula is composed of bilateral external openings joined by a deep post-anal communication in the post-midline, resulting in a U- or horseshoe-shaped configuration⁹. Patients with horseshoe fistula usually undergo multiple drainages and unsuccessful fistula surgery before they reach a definitive diagnosis and treatment. The aggressive nature of this type of fistula is also confirmed by the high rate of Crohn's disease in patients with horseshoe fistula^{10,11}.

Patients with horseshoe fistula are usually advised to have surgery for their problems. There are several operations like fistulotomy, cutting seton, fibrin glue injection, fistula plug, and endorectal advancement flap¹¹. It was found that all these procedures are just temporary solutions, as invariably the fistula recurs. Besides, a lot of complications can occur due to surgery, like urinary retention, bleeding, thrombosed pile, faecal impaction, incontinence of stool, anal stenosis, and delayed wound healing. Treatment of horseshoe fistula by faecal diversion alone did not resolve horseshoe fistula¹².

HANLEY'S PROCEDURE:

Horseshoe fistula, as it is a complex fistula, will lead to potentially morbid conditions. Hanley, 1965, reported his original procedure for horseshoe fistula, which involved the complete division of the posterior 12 o'clock sphincter mechanism down to the deep postanal space. Counter drains were placed through each lateral extension and were removed several weeks afterward.

II. MODIFIED HANLEY'S PROCEDURE:

The aggressive management of the Horseshoe fistula by Hanley's procedure obliterated the source of the fistula but at the inevitable price of a high incidence of anorectal incontinence. In 1990 modified Hanley procedure was adopted, in which the posterior sphincter was divided gradually by using a cutting hybrid seton placed around the 6 o'clock sphincter mechanism. This seton was serially tightened until the posterior sphincter was divided and it was tethered by the resulting scar tissue¹². Hanley's procedure with drainage of deep postanal space and cutting and drainage of hybrid setons proved to be safe and successful and did not result in faecal incontinence. Complete healing of the fistula may take weeks or several months, but patients remain functional even with a seton in place¹³.

III. SINGLE-STAGE MODIFIED HANLEY'S PROCEDURE:

This study presents the effectiveness and results obtained with a single-stage modified Hanley operation in the surgical management of 25 patients with a complex horseshoe anal fistula. The post-anal space is reached through a post-anal transverse incision at the 6, 0-clock position, and the post-anal space is thoroughly curated and drained. The connection of secondary tracts was identified, and they are encircled externally and deroofed from the surrounding tissues and reach up to the post-anal space without cutting the post-anal sphincter. The tracts were excised in toto along with the post-anal space. The wound is well irrigated, a Penrose drain is kept, and continuous dressing and irrigation are done in the postoperative period.

The aim of the study was to document our clinical experience in managing patients with horseshoe fistula of cryptoglandular origin with modification of the Hanley procedure using a single-stage approach.

IV. PATIENTS AND METHOD:

This is a prospective study done in the period between February 2020 and December 2022 with 25 patients—20 males and 5 females—presenting with chronic horseshoe fistula. Age range: 19–73 years.

The inclusion criteria were,

- Posterior horseshoe complex fistulas, defined as fistulas that have multiple tracts with single or multiple external openings,
- The involvement of deep postanal space is demonstrated by digital rectal examination and by preoperative MRI.

Exclusion criteria included:

- patients with low and superficial fistulas,
- Patients with no deep postanal space affection and patients with fistula secondary to other pathology rather than cryptoglandular anal infection (carcinoma, IBD, trauma, radiation).

Institutional ethical clearance was obtained.

V. PROCEDURE:

All patients were subjected to the preoperative measures, which include a detailed history, a thorough and full clinical examination, including a PR examination to check for sphincter tone, a preoperative MRI to demonstrate the extent of the fistula, and deep postanal space affection. Routine preoperative laboratory investigations were done, and informed consent was obtained from all patients. All patients were prepared preoperatively and had an enema the night before surgery. All operations were performed with patients in the lithotomy position and under spinal anaesthesia.

During the operation, the fistulous tract was gently probed with a small, blunt-tipped, malleable metal probe. The portion of the tract outside the sphincter was laid open and curetted; in addition to the excision of the superficial segment of the lateral tract, ischiorectal spaces were curetted as well. The skin and anoderm overlaying the fistulous tract were incised.

Postoperative continence was assessed using the classification according to the Wexner score for faecal incontinence and according to Browning and Park's classifications, in which category

1. continence for solid, liquid, and flatus (i.e., normal continence),
2. continent for a solid and liquid stool but not for flatus,
3. continent for solid stool with no control over and category
4. with continued faecal leakage.

Patients were in the hospital for a minimum of 5 days and treated with antibiotics, analgesics, and sitz baths. The cases were followed up weekly for the first month and then once a month for six months. Patients were advised to contact us whenever they faced any problems. All the patients had complete healing within 30 days. There was no significant incontinence reported in our postoperative follow-up.



Fig.1. Patient with Horseshoe Anal fistula

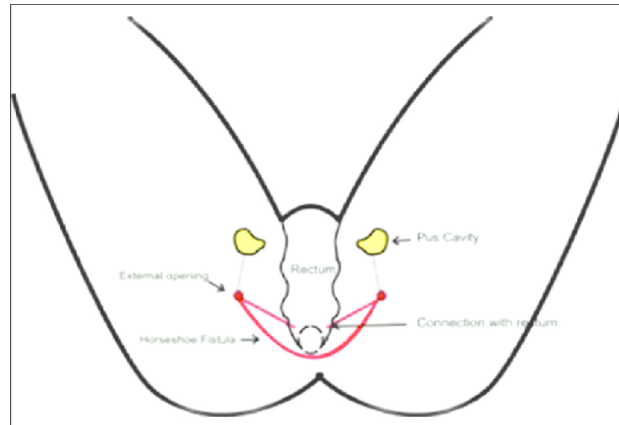


Fig.2: Schematic diagram of horseshoe fistula

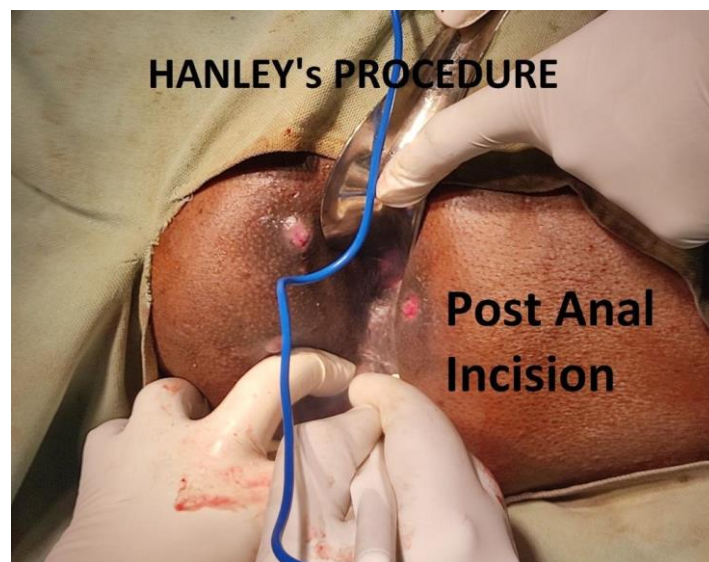


Fig 3: Post Anal incision

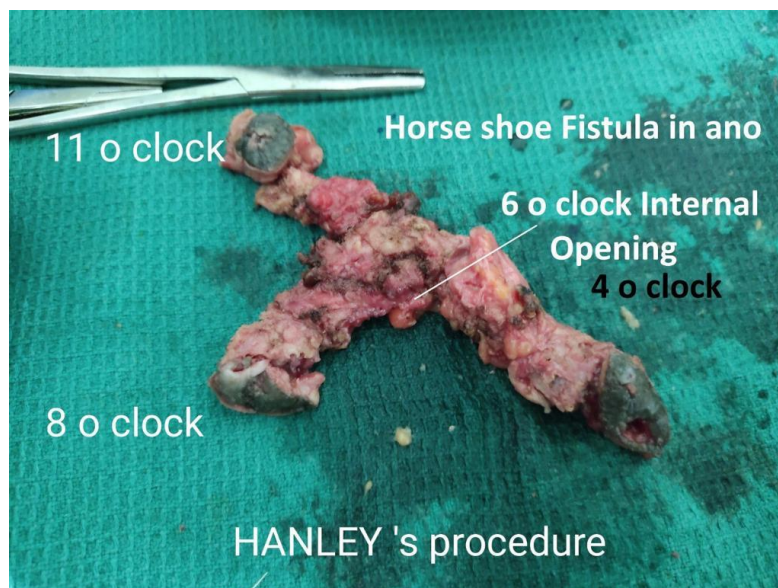


Fig.4: Excised fistulous tract

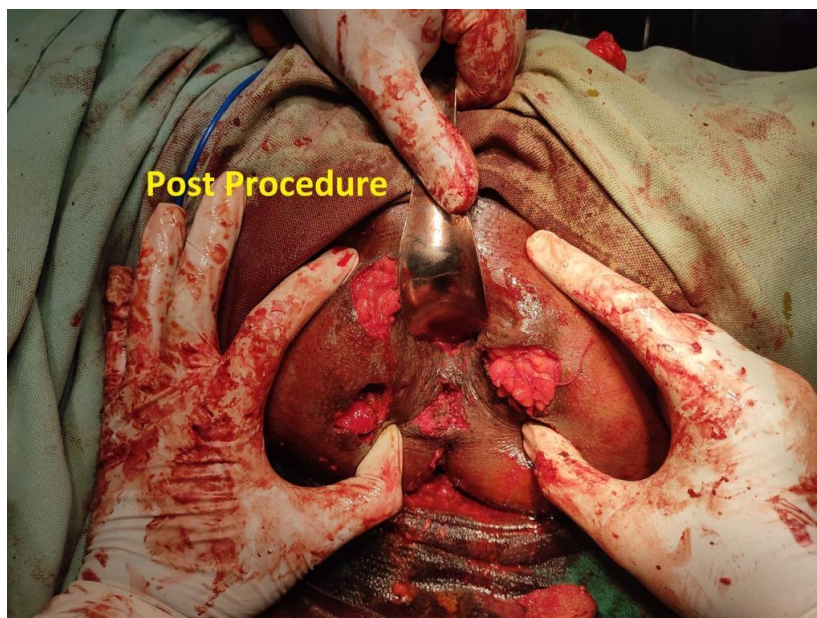


Fig 5: Post Surgery

Patients were able to return to regular work in 3-4 weeks. Incontinence was not in all patients. The recurrent fistula was noted in 2 patients only after a mean follow-up of six months.

VI. Results

Twenty-five patients presented with posterior horseshoe complex anal fistula underwent an anal fistula operation by a single-stage modified Hanley procedure during the study period. Table (I) summarized their characteristic. The median age was 43 years with a predominance of male patients (20 patients, 71.4%). In 16 patients (57.1%) had undergone a previous operation to treat anal sepsis, 21 patients had no previous history of surgery to treat anal fistula, whereas the rest presented with recurrent fistula. Baseline stool or gas incontinence symptoms did not see in all patients. Seven patients involved in this study were diabetics (25%).

| Characteristic | No. % |
|---|--------------|
| Age (range) | 43 (19-73) |
| Gender | No. % |
| Male | 20(71.4) |
| Female | 8(28.6) |
| Duration of symptoms in weeks | 28 weeks |
| Previous operation for anal sepsis | 16(57.1) |
| Baseline incontinence for stool and gas | |
| External opening from the anal verge | |
| Within 3 cm | 10 (35.7%) |
| Beyond 3 cm | 18(64.3%) |
| Internal opening | |
| -at dentate line | 12(48) |
| -above dentate line | 13(52) |

Table I: Characteristics of 25 patients with posterior horseshoe anal fistula.

Nearly half of patients had high trans-sphincteric fistula in ano and had internal opening above dentate line. Complete healing was achieved in 10-12 weeks. All patients were followed up for minimum period of six months. None of the patients had bleeding, wound infection, premature dislodgement or slippage of seton. Recurrence was found in three patients (10.7%). The causes of recurrence as shown in table (2) were high type horseshoe fistula, recurrent fistula and in diabetic patients.

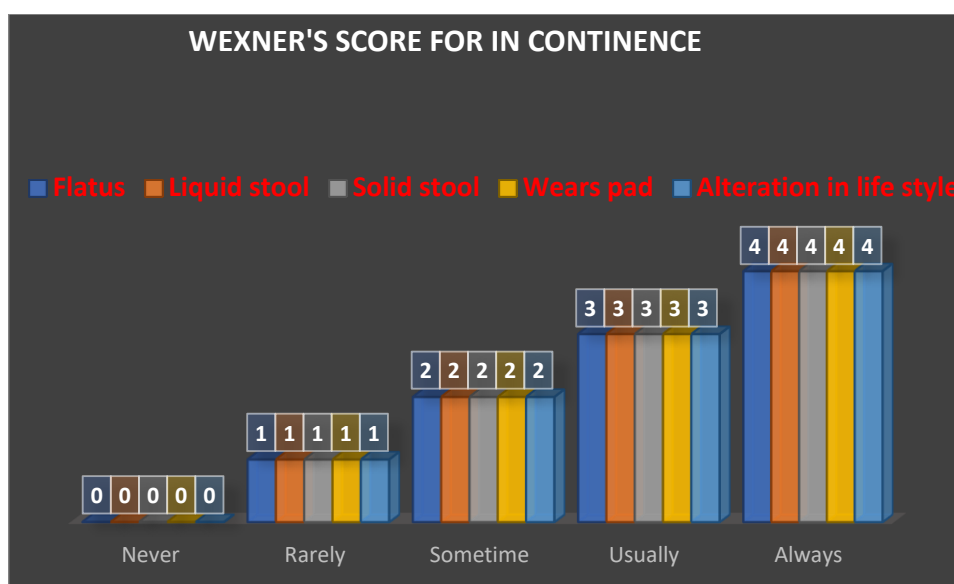
| Characteristics | Recurrence(n=3) | No recurrence (n=22) |
|-------------------------|-----------------|----------------------|
| Diabetes mellitus | 2 | 6 |
| Previous surgery | 1 | 16 |
| Type of fistula | | |
| Low | 1 | 6 |
| High | 2 | 16 |
| Type of fistula | | |
| Primary | 1 | 16 |
| Recurrent | 2 | 6 |
| Internal opening | | |
| -Below dentate line | 0 | 6 |
| -Above dentate | | |

Table II: Risk factor for recurrence

| Characteristic | Never | Rarely | Sometime | Usually | Always |
|--------------------------|-------|--------|----------|---------|--------|
| Flatus | 0 | 1 | 2 | 3 | 4 |
| Liquid stool | 0 | 1 | 2 | 3 | 4 |
| Solid stool | 0 | 1 | 2 | 3 | 4 |
| Wears pad | 0 | 1 | 2 | 3 | 4 |
| Alteration in life style | 0 | 1 | 2 | 3 | 4 |

Table III: Wexner's score for fecal incontinence

(Range (0-20); 0-normal, 20-maximum incontinence with maximal disturbance of life style)



VII. Discussion

Fistula in ano is one of the most frequent anorectal pathologies, with a spectrum of clinical presentation⁵. The route and extent of the fistulae and the associated acute suppuration are defined by the origin in the crypto glandular complex and the involvement of the anatomically circumscribed perirectal space. The superficial and deep postanal spaces of Courtney are located behind the anal canal. Both communicate on either side, with the ischioanal fossa providing the pathway for the formation of horseshoe abscesses and fistula⁸.

Suppurative anorectal disease involving the deep postanal space comprises less than 15% of all types of anorectal sepsis. **12.** Horseshoe abscess and fistula with primary opening of the posterior midline, a trans-sphincteric extension to the deep postanal space, and bilateral involvement of the ischioanal fossa represent the most severe manifestations **13.** It remains a complex and challenging clinical entity due to its configuration, depth, and degree of sphincter involvement. The management of the anal fistula in an effective manner has always been a challenge for surgeons the world over. The conventional operative treatment of the anal fistula is to lay open or completely excise the fistula tract and allow healing by open granulation¹⁴. In high anal fistulas, including horseshoe types, complete excision is not possible due to the involvement of anal sphincters.

In 1965, Hanley proposed a treatment strategy for horseshoe fistula based on the conventional description of the postanal space of Courtney. This included a bilateral para-anal incision over the ischioanal space to drain the infra levator lateral extensions of the horseshoe and packing with gauze wicks. Hanley's

proposed technique was a less morbid and more successful alternative to complete unroofing, which had been the standard operation at that time¹⁵.

A decade later, Hamilton published his experience with a similar technique and reported a 6.2% recurrence.¹⁶ So the original Hanley procedure was associated with a high incidence of faecal and flatus incontinence. In 1990, a modification of the Hanley procedure for the management of horseshoe fistula using a hybrid seton elastic (glove seton) was made in order to preserve the anal sphincter and prevent incontinence.

We adapted a single-stage modified Hanley's procedure for all our patients included in this study to manage their horseshoe fistula, and the surgical outcome of using this procedure during the study period from February 2020–December 2022 was analyzed.

The ischioanal space was thoroughly curetted, and after draining the pus, it was irrigated with povidone and hydrogen peroxide solutions and later with saline. The space is packed with dressing soaked in a 4% povidone iodine solution.

In all our patients included in this study, internal openings were noted in the posterior midline at the level of the dentate line, which indicates the presence of an associated deep postanal abscess. If this abscess is not drained, the definite treatment of the fistula cannot be achieved; this is the most important point in the surgical treatment of a horseshoe fistula.

The presence of horseshoe fistula in this study was diagnosed by the nature of the disease, history of discharge, and the physical examination alone. The patients had purulent, often blood stained perianal discharge from the two or more external openings in the ischioanal fossa and also had intermittent pain. MRI, contrast fistulography, and ultrasound for delineating the collection of pus are used as per the need. MRI is mainly used for patients with recurrences of fistulas and complex courses. In our observation, the MRI is superior to contrast fistulography.

Beets Tan et al^{18,19} evaluated the accuracy of MRI for the detection of anal fistulas and the additional clinical value of preoperative MRI. He correlated the MRI findings with findings during surgery and found its sensitivity and specificity for detecting horseshoe fistula tracts to be 100% and 100%, respectively.

In our study, for a few patients we did not perform routine radiological studies using MRI and contrast fistulography. However, all had extensive clinical evaluation and on table hydrogen peroxide and probe examination.

On the table, the course of the fistula tract is confirmed by injecting hydrogen peroxide into one of the external openings of the horseshoe fistulas. Although the passage of a probe from both the external and internal aspects is the most reliable technique to identify a fistula tract intra-operatively, the injection of various substances such as methylene blue, indigo carmine, hydrogen peroxide, or even milk has been described and widely used. Hydrogen peroxide is probably the best means for identifying the internal opening, since the pressure created by the bubbles, may be sufficient to penetrate even a stenotic tract^(20,21). In our series, we cannulate the fistula tract by blind-tip probe after injecting hydrogen peroxide, which is an essential step of the fistula surgery. Probing not only provides identification of the course of the fistula tract but also facilitates the fistulotomy over the probe. Probing should be gentle, otherwise, it will result in the creation of a false route, which further complicates the operative procedure.

A partial fistulotomy with counter-drainage of the lateral tract and a posterior midline incision to reach the deep postanal space is made by electrocautery. We prefer electrocautery because it provides better homeostasis than the traditional knife.

VIII. Conclusion

Although horseshoe fistulas are not common, they are challenging due to their configuration and sphincter involvement. A modified Hanley procedure with drainage of the deep postanal space and en masse removal of the secondary fistulous tracts without cutting the postanal sphincter proved to be a safe and successful method that did not result in faecal incontinence.

So, in this study, we confirmed that the modified Hanley operation is an effective and conservative surgical procedure that eliminates the disadvantage of keeping the seton for a long period of time and is a useful method for the preservation of sphincter function.

References

- [1]. Courney H. Basic anatomic principles of fistula surgery. *J Int coll surg.* 1956;75:513-19.
- [2]. Williams JG, Farrands PA, Williams A B, et al. The treatment of anal fistula ACPGB1 Position statement colorectal Dis 2007;9 suppl 4:18
- [3]. Whiteford MH, Kilkenny J 3rd, Hyman N et al. Practice parameters for the treatment of perianal abscess and fistula in ano (revised). *Dis Colon Rectum* 2005;48:1337
- [4]. Byrne C, Soloman M. The use of seton in fistula in ano. *Semin ColoRectal Surg* 2009;20:10
- [5]. Hanley P H. Conservative surgical correction of horseshoe abscess and fistula *Dis Colon Rectum* 1965;8:364
- [6]. Gordon PH. Anorectal abscess and fistula in ano 1999. In principle and practice of surgery colon, Rectum and anus, 2nd, edition. Gordan PH, Nivatronics. Sed. Quality medical publishing. Pub pp241-288.

- [7]. Oh,C. Management of high recurrent anal fistula .Surgery 1983;93:330-332
- [8]. Hanley PH: Anorectal Abscess fistula .Surg Clin North Am 1978,58:487-503
- [9]. Corman ML: Anal fisula In colon and rectal surgery Philadelphia: J.B. Lippincott Company:1984:94-106
- [10]. Nelson H, Dozois RR: Anus In Sabistan textbook of surgery: The biological basis of modern surgical practice Edited by: Townsend Jr CM, Beauchamp RD, Evers BM, Mattox KL. Philadelphia: Wib. Saunders; 2001:974-996.
- [11]. Ustynoski K, Rosen L , Stasik J, Riether R , Shecet J, Khubchaudani IT:Horse shoe abscess fistula. Seton treatment. Dis colon Rectum1990.33:602-605.
- [12]. Pezim ME: Successful treatment of horse shoe fistula requires deroofing of deep post anal space. Am J Surg 1999, 167:513-515.
- [13]. Held D, Khbehandani I, Sheets J, Stasik J, Rosen L, Riether R: Management of anorectal horse abscess and fistula. Dis colon Rectum 1986,29:793-797.
- [14]. Modiefied Hanley procedure for management of complex horse shoe fistulae. Browder LK, Sweet S, Kaiser Am .Tech colorectal .2009;13:301-6 Epub.
- [15]. Hamilton CH.Anorectal problems: The deep post anal space-surgical significance in horseshoe fistula abscess. Dis Colon Rectum 1975;18:642-5
- [16]. Rosen SA, Colquhoun P,E Form J, Vernava AM 3rd , Nogueras JJ, Wexner SD, EG. Horse shoe abscess and fistula: How are we doing ?Surg Innov.2006;1:7-21.
- [17]. Hammod TM, Knowles CH, Porrett T, Lunniss PJ. The surgical seton: short and medium results of slow fistulotomy for idiopathic anal fistulae.Colorectal Dis 2006;8:328-337.
- [18]. Leventoglus S, Ege B, Menten BB, YorubulutM, Soydan S, Aytac B. Treatment for horseshoe fistula with modified Hanley procedure using a hybridseton :result of 21 cases. TechColo Proctol. doi: 10:1007/s 105/-012-0952-o Epub 2012Dec 4
- [19]. Pearl RK, Andreas JR, Orsay CP. et al. Role of seton in the management of anorectal fistula .Dis colon Rectal .1993;36:573-577
- [20]. Graf W, Pahlman L, Ejerblod. Functional results after seton treatment of high trans sphincteric anal fistulas .Eur J Surg 1995;161:289-291.
- [21]. Joy HA, Williams J. The outcome of surgery for complex anal fistula. Colorectal Dis 2002; 4:254-261
- [22]. Durgun V, Perek A, Kapan M, Kapan S. Partial fistulotomy and modified cutting seton procedure in the treatment of high extra sphincteric perianal fistulae. Dis Surg 2002;19:56-58
- [23]. Garcia –Aguilar J, Belmontec C, Wong DW, Goldberg SM, Moddoff RD. Anal fistula surgery, factors associated with recurrence and incontinence. Dis Colon Rectum 1996;39:723-729.
- [24]. Menten BB, Oktemer S, Tezcaner T, Azili C, Leventoglues S, Oguz M. Elastic one stage cutting seton for the treatment of high anal fistulas: Preliminary results. Tech Colo Proctol 2004;8:159-162.