

Original Research Article

Nigam's modified Roeder's knot with cutting seton has advantages over hybrid cutting seton in high and complex fistula-in-ano

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ABSTRACT

Background: Cutting seton is usually used in high or complex fistula-in-ano. Cutting seton with Nigam's Modified Roeder's Knot avoids rethreading and re-application of the cutting seton when becomes loose as the tightening is done in OPD during dressing without any pain or discomfort. While hybrid cutting seton of rubber or latex does not give the advantages of cutting seton with NMRK.

Methods: Cutting seton with NMRK is an easy method of seton application in high and complicated cases of fistula-in-ano. It avoids recurrence as well as anal incontinence which is common after surgery for high and complex fistula-in-ano.

Results: Cutting seton with NMRK is devoid of any post-operative serious complications. Recurrence and anal incontinence rate are minimal.

Conclusions: Cutting seton with NMRK is proved to be better with application of hybrid seton in cases of high and complex fistula-in-ano.

Keywords: Fistula-in-ano, Hybrid, NMRK, Seton, Sphincter

INTRODUCTION

Fistula-in-ano is a common problem in which rectum or anal canal is connected to the perianal skin via a tract. A fistula develops as a consequence of a perianal abscess.¹ Infact, the fistula, also called fistula-in-ano, is considered a chronic variant of a poorly healed anorectal abscess.² Fistula-in-ano is a tract connecting two openings, one on perianal skin and another on mucosa of anal canal or rectum. It usually happens when an anal abscess develops.

The anal abscess causes pain near anus which is accompanied with redness and swelling in the perianal area making sitting and passing stool painful. If not treated in time it opens up spontaneously discharging foul-smelling pus or blood-stained dirty fluid or frank

pus. Cryptoglandular infections are the most common etiology, resulting from suppuration of anal crypts located in the dentate line, leading to ano rectal abscess.³ Anorectal fistulas can occur following a spontaneous drainage of these abscesses or can form after a surgical drainage of anorectal abscess. Usually, anal fistulas are caused by blockage of anal glands due to infection or trauma.

Chronic infections like tuberculosis and Crohn's disease are also the etiological factors. Fistula-in-ano is a common anorectal condition, more prevalent in men (12.3 cases per 1,00,000) than women (5.6 cases per 1,00,000), typically diagnosed around the age of 38, with a peak occurrence between 20 and 40 years of age.^{4,5} Between 30% and 70% of patients who have an anorectal abscess also have a fistula-in-ano at the same time.^{6,7}

The most common and widely used classification of fistula-in-ano is Park's classification, which classifies fistula-in-ano in following categories:⁸ Intersphincteric fistula: It travels between internal and external sphincters; Transsphincteric fistula: It passes through both sphincters; Suprashphincteric fistula: It penetrates internal sphincter and then crosses over the external sphincter and comes down to open on perineal or perianal skin; Extrasphincteric fistula: This usually starts from rectum and goes laterally over both sphincters and then curves down and opens in perineal or perianal skin.

The diagnosis of fistula-in-ano though depends upon thorough history and physical examination but MRI fistulogram is considered the most reliable method for detecting fistula anatomy, complexity, and activity.⁹ There are many techniques to treat a fistula like fistulotomy, seton placement, ligation of intersphincteric fistula tract (LIFT), endorectal advancement flap (ERAF), fiber glue, anal fistula plug, fistula laser closure, video assisted anal fistula treatment (VAAFT) and adipose-derived stemcells.¹⁰

The placement of seton is an established treatment option for individuals with perianal fistulas, as it aids in the drainage or closure of the fistula.¹¹ Hybrid seton is now used in place of an ordinary seton. It is made of soft elastic material such as a rubber or latex band. Haley first reported the use of rubber band seton in the surgical management of anterior abscess anal fistula and anterolateral fistula in women with good functional results.¹²

Seton with adjustable slip knot, Nigam's modified Roeder's knot (NMRK) is an advanced method of fistula treatment. The NMRK can be used both in cutting and draining setons. It results in an improved outcome with minimal discomfort to the patient during retightening as it does not need rethreading and reapplication of the seton.¹³

The objective of the study is to evaluate the importance of cutting seton with Nigam's modified Roeder's knot as advantages over hybrid cutting seton in high and complex fistula-in-ano including its success rate and reduction of post-operative complications like fecal incontinence and recurrence.

METHODS

Our team performed 90 surgeries for various types of fistula-in-ano. The surgeries performed by partial fistulectomies with seton application for high fistulae-in-ano. Setons, draining and cutting were applied with Nigam's modified Roeder's Knot in every case of seton application. The study span varied from January 2006 to January 2026 in Max Hospital and other hospitals of Gurgaon. Setons used were made of Ethibond Excel Polyester suture No.5 (MB46G), a nonabsorbable

braided, and sterile suture. 'NMRK' is an adjustable slip knot. Every patient was explained about fistula-in-ano and the treatment advised. Informed consent was taken from every patient with explanation of possible complications. Ethical approval was included. Our study included 70 men (77.8%) and 20 women (22.2%). Age of patients varied from 17 years to 70 years but most of the patients were between 30 and 40 years of age. Most of the patients in our study were having average body weight (42.3%) and over weight (35.5%) (Table 1).

The study included patients with high and complex fistula-in-ano. Horseshoe fistula, fistulae secondary to malignancy and inflammatory bowel diseases were excluded from this study. Physically all patients were examined and DRE done. All patients underwent routine proctosigmoidoscopy. MRI-fistulogram to visualize fistula tracts in detail was done for every case.

Phosphate enema followed by saline bowel wash was given to every patient in the morning of operation. Every patient was given 500 mg metronidazole and 1.2 gm of Augmentin intravenously after the sensitivity test in the operation theatre before surgery.

Operations were done under general or spinal anesthesia. Patients were placed in the lithotomy position. Examination under anesthesia was done routinely with all patients. After cleaning and preparing the parts for operation a blunt malleable probe was carefully inserted into the fistula tract without much pressure to avoid creating a false passage.

Methylene blue dye was then injected in the fistula tract along with keeping a transparent anoscope/proctoscope in the anal canal and rectum to observe the exit point of dye. Fistula tract was opened and excised for 2-3 cm till sphincter fibers were visible and the skin between this opening of fistula and anal verge was incised.

The seton was passed from external opening of the fistula to the internal opening of the fistula with the help of malleable probe and then the two ends of seton were tied over the sphincter with NMRK. Seton was tightened when became lax at one week or less intervals until the sphincter was severed and seton dropped.

There was no pain when the NMRK was tightened, as it is a slip knot, during the dressing. The knot was tied so the seton was snugly placed around the sphincter. NMRK has only two loops after the first stitch, while Roeder's knot has three loops. In addition, NMRK can slip better than Roeder's knot.^{14,15}

Statistical analysis of this study includes data from operations such as duration, recovery times, complications, and survival rates to measure safety, efficacy, and patient outcomes.

Table 1: Distribution of cases according to demography (n=90).

Gender, age and BMI	Number of Cases	Percentage (%)
Gender		
Male	70	77.8
Female	20	22.2
Age (years)		
10-20	04	4.4
21-30	12	13.3
31-40	58	64.5
41-50	15	16.7
Above 50	01	1.1
BMI		
Under weight	0	0
Average weight	38	42.3
Obese or overweight	32	35.5
Morbidly obese	20	22.2

Table 2: Distribution of cases according to post-operative recurrence and fecal incontinence (n=90).

Complications	Number	Percentage (%)
Recurrence	2	2.2
Anal incontinence	4	4.4

Table 3: Distribution of cases according to wound healing period (n=90).

Healing period	Number	Percentage (%)
4-6 weeks	35	38.9
7th week	46	51.1
9th week	9	10

RESULTS

High fistula-in-ano and complex fistulas are having some post-operative complications. No serious post-operative complication happened in this study. In this study the incidence of post-operative complications remained low. Fecal incontinence happened only in 4 (4.4%) patients while the two patients (2.2%) developed recurrence in high and complex fistula-in-ano. Healing time in our study remained low. Majority of cases (90%) healed completely between 4 to 7 weeks.

Patrick H. Hanley first published his work, Rubber Band Seton in the Management of Abscess-Anal fistula in Anal of Surgery in 1978. Hanley explained that the seton initially acts as a drain to divert the spread of suppuration, converting a complicated fistula to a simple anal fistula. After the simple anal fistula is formed, the seton is tightened at three- or four-weeks intervals until the sphincter is severed. There is no pain or loss of time at work.

In a study of hybrid seton by Ege et al healing occurred upto 3 months, worsening of the incontinence score was noted in 7 (5.46%) patients. Khan et al studied use of hybrid seton, wrist band of a glove, in 94 patients in Bangladesh. 59.6% of patients required more than 60

days for complete wound healing. The recurrence rate within 6 months was 12.8%. A multicenter study about outcomes of a hybrid seton use in high transsphincteric fistula-in-ano by Yildirack et al revealed the use of latex glove derived seton, in 41 (56.9%) patients, the seton dropped after the first tightening whereas 5 (6.9%) patients required two tightenings and 14 (19.4%) required three tightenings before seton drop occurred. A second surgical procedure was required in 8 patients (11.1%). Recurrence after initial healing was observed in 7 patients (9.7%).

DISCUSSION

The management of perianal fistula has been documented in literatures for thousands of years, dating back to the time of Hippocrates in 400 BC. Sushruta (600 BCE) also referred as the father of Indian surgery has mentioned Kshara Sutra therapy (Ayurvedic seton) for the management of anal fistula and it has proven efficacy by virtue of chemical cauterization.^{19,20} Fistula-in-ano is only treated by surgery. The curative treatment of fistula-in-ano is not an easy surgical work due to its two post-operative complications, fecal incontinence and recurrence. Complex anal fistulas transverse a significant portion of the external sphincter muscle, making their treatment a surgical challenge.²¹

Table 3: Comparison of outcomes of cutting seton and hybrid seton techniques in the management of anal fistula.

Studies	Complications	Healing time
1 Cutting seton with NMRK, Nigam et al¹³	Recurrence 2% Anal incontinence 4%	4-7 weeks
2 Hybrid seton, (Latex glove derived seton) Ege-B et al¹⁶	Recurrence 1.5% Anal incontinence 5.46%	3 months (12 weeks)
3 Hybrid rubber seton, Khan et al¹⁷	Recurrence 12.8%	6 to 10 weeks
4. Hybrid approach (latex glove derived seton) Yildirack et al¹⁸	Recurrence 9.7% Three tightening required A second surgical procedure required in 11.1% cases	3 months - Upto 1 year Thrice weekly tightening of hybrid seton required.

A cutting seton with Nigam's modified Roeder's knot (NMRK) which is adjustable slip knot improves the outcome. Simultaneous multiple application of seton with Nigam's modification of Roeder's knot helps in lowering the post-operative fecal incontinence.²²

The initial pressure of the soft rubber or latex hybrid seton diminishes after certain period when few fibers of the sphincters are severed then either a new hybrid seton should be placed or the present one should be tightened. Yildirak MK et al stated that they required tightening of hybrid seton from one to three times. Besides treating, continence is the next goal to be achieved. Related literatures report a 0%-5% rates of incontinence when hybrid seton treatment is applied.^{23,24}

There is a persistent draining of serous or purulent discharge from the wound unless it heals completely after hybrid seton application. Ideally every surgical procedure should be standardized but here the hybrid seton approach has no standardization or universal consensus. After use of hybrid seton the branching tracts can cause recurrence. More recently, Hammond and coworkers reported the case of a 1-mm silastic seton which was 'snugly' tied around it's ends. In their series of 29 patients, healing was achieved in 100% with minor incontinence in 25%.²⁵ In rest of 75% cases healing took more time. Fecal incontinence is a major concern in anal fistula technique.²⁶ While various seton techniques are employed in clinical practice, there is a lack of standardized protocols and outcome-based research specific to the hybrid rubber seton.^{27,28}

Advantages of Cutting seton with NMRK are: In high or complex fistula-in-ano cutting seton with NMRK allows gradual adjustable tissue division as an outpatient procedure. This technique promotes progressive fibrosis that preserves anal sphincter continuity. It avoids repeated hospitalization under anesthesia. It significantly reduces the risk of fecal incontinence. It also reduces the chances of recurrence. It is a cost-effective procedure. Controlled tension adjustments reduce severe, sudden pain and allow patients to continue normal daily activities.

Disadvantages of hybrid Cutting seton: It has potential risks of incontinence. There is lack of standardized surgical steps across different centers and hospitals. There is short term irritation and possibility of bleeding. Long term outcomes studies are still required. It has prolonged healing time. Recurrence rate according to some reports range roughly 6% to over 12%.¹⁷

Limitations

Limitations of our study includes acute perianal abscess alone or with a fistula.

CONCLUSION

High and complex fistula-in-ano are difficult to treat as post-operative anal incontinence and recurrence are two major complications which occur quite commonly after various surgeries. Cutting seton with NMRK application prevents recurrence and anal incontinence considerably. Hybrid cutting seton are nowadays used at some institutions, but the success rate and complication incidence are far less than cutting seton with NMRK.

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