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TRANSRECTAL ULTRASONOGRAPHIC STUDIES FOR EVALUATION OF ANAL SPHINCTERIC INJURIES FOLLOWING KSHARSUTRA THERAPY: A CLINICAL STUDY

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ABSTRACT

Fistula in ano is an age old problem and the operations for this disease were designed from time to time to suit the needs of the day. Many surgical procedures available for the treatment of fistula in ano but the results of these procedures are not very satisfactory especially for the treatment of complex and recurrent fistula in ano. Even so much advancement in surgery there is still a big challenge to surgeons for the management of fistula in ano. As many surgical procedure frequently leads to complication like recurrence, incontinence, delayed healing which creates psychological troublesome along with discomfort. Aim of treatment of fistula in ano is to while preserving anal function and continence to permanently eliminate abscess formation and to promote active healing, because over aggressive fistulotomy can lead to postoperative fecal incontinence.

KEYWORDS: TRUS:Transrectal Ultrasonography, AES: Anal Endosonography, EMG: Electromyography, LIFT: Ligation of Intersphincteric Fistula Tract, DRE: Digital rectal examination, EUS: Endoanal ultrasound, EAS: External Anal Sphincter, IAS: Internal Anal Sphincter.

INTRODUCTION

The anal fistula has been a common surgical ailment reported since the time of Hippocrates (460-356 BC) but little systematic evidence exists on its management. This disease is not life threatening but caused discomfort and pain to patient which create problem in routine work.

The disease fistula in ano and haemorrhoids form the greatest percentage of diseases pertaining to the ano-Rectal region, of them fistula in ano is a disagreeable condition for the patient and often creates problems which become the source of his restlessness. The disease is not only limited to a particular race but has a uniform distribution throughout the world.

Recurrence and feacal incontinence is the major problem in surgical treatment of fistulae which can worse the previous condition. Reported recurrence and incontinence range from 0 to 32% and from 0 to 63% respectively during various surgical treatment.[11]

Fistulotomy and fistulectomy is the primary treatment for simple intersphincteric fistula in which recurrence ranges in the literature from 0 to 9% and disturbance in continence varies from 0 to 33%.[1-10] Though, present available methods of treatment like endorectal advancement flap core- out and ligation of intersphincteric fistula tract (LIFT) have improved the outcome of treatment in respect of less failure and preserving continence.

The success rate of endoanal advancement flap ranges from more recent series is 60–70%.[12] Most papers report no deterioration in continence, however, Mizrahi *et al* reported 9% incidence of deterioration in continence. Schouten *et al* reported that 26 patients with normal continence preoperatively, of these 38% reported flatus incontinence and 12% faecal incontinence.[13]

However, LIFT technique has been given good results for treating anal fistula but this is limited to uncomplicated transphinteric and intersphinteric fistula. The success rate is considered from 57%-94% with minimal morbidity and little or no impact on continence status.[14,15]

Shshruta (1500-1000 BC) had explained fistula in ano in detail with surgical and parasurgical management. ***Sushruta*** described the use of *Ksharsutra* for the management of *bhagandara* (fistula in ano) and nadi vrana.

AIMS AND OBJECTIVES

Ano-rectal injuries can be assessed in two ways.

1- Clinical assessment – By Fecal incontinence severity index
2- Anatomical assessment – By Transrectal ultrasonography (TRUS)

Fecal incontinence severity index is based on four type of leakage (gas, mucous, liquid stool, solid stool) and five frequencies (1-3 per month, 1 per week, 2 per week , 1 per day, 2 or more per day) Other severity index scales include –AMS, Pescaturi, William score, Kirwan score and vaizey scale.

Testing of Continence

1. QUESTIONNAIRE

We need to assess the severity of your symptoms. Please answer the following questions on a scale of 0- 10 in which 0=no problem and l0=the most severe it has ever been.

1. (a) When you pass stool do you any warning?

Always plenty of Warning — No warning at all

0 _____ 10 [ ] [ ]

(b) Can you distinguish between gas and solid stool?

Always distinguish — Never distinguish

0 _____ 10 [ ] [ ]

2. If you have loss of bowel control for gas, answer the following questions. If this is not a problem write 0 to all the questions. If the question does not apply to you do not write anything.

(a) How frequently does it occur?

Never | Less than Once a month | Less than once a week | Every day | Many times a day

0 _____ 10 [ ] [ ]

(b) How much 'gas' do you leak?

None — A lot

0 _____ 10 [ ] [ ]

(c) How bad is the problem?

None — A terrible problem

0 _____ 10 [ ] [ ]

(d) How much does it interfere with your social life?

Never — A great deal

0 _____ 10 [ ] [ ]

(e) How much does it interfere with your work situation?

Never Had to stop working

0 _____ 10 [ ] [ ]

(f) How much does it interfere with your sexual relations?

Never Stopped intercourse

0 _____ 10 [ ] [ ]

3. if you have loss of bowel control for liquids, answer the following questions. If this is not a problem write 0 to all the questions. If the question does not apply to you do not write anything.

(a) How frequently does it occur?

Never Less than Once a month | Less than once a week | Every day | Many times a day

0 _____ 10 [ ] [ ]

(b) How much 'gas' do you leak?

None A lot

0 _____ 10 [ ] [ ]

(c) How bad is the problem?

None A terrible problem

0 _____ 10 [ ] [ ]

(d) How much does it interfere with your social life?

Never A great deal

0 _____ 10 [ ] [ ]

(e) How much does it interfere with your work situation?

Never Had to stop working

0 _____ 10 [ ] [ ]

(f) How much does it interfere with your sexual relations?

Never Stopped intercourse

0 _____ 10 [ ] [ ]

4. If you have a loss of bowel control for solid stool, answer the following questions. If this is not a problem write 0. If the question does not apply to you do not write anything.

(a) How frequently does it occur?

Never Less than Less than Every Many

Once a month once a week day times a day

0 _____ 10 [ ] [ ]

(b) How much 'gas' do you leak?

None A lot

0 _____ 10 [ ] [ ]

(c) How bad is the problem?

None A terrible problem

0 _____ 10 [ ] [ ]

(d) How much does it interfere with your social life?

Never A great deal

0 _____ 10 [ ] [ ]

(e) How much does it interfere with your work situation?

Never Had to stop working

0 _____ 10 [ ] [ ]

(f) How much does it interfere with your sexual relations?

Never Stopped intercourse

0 _____ 10 [ ] [ ]

Questionnaire – scoring system((cleveland Clinic from oliveka et a! 1996)

	Never	**<1/month**	**<1/week to 1/month**	**<1/day to 1/week**	**daily**
	0	1	2	3	4
Flatus					
Liquid					
Solid					
Use of pad					
Alteration of life style					

0 – no incontinent

20 – complete incontinent

2. Anal Endosonography (AES) / Transrectal ultrasonography (TRUS)

Anal ultrasound is used to look for anatomic abnormality of the anal sphincters. Ultrasound has replaced EMG as the best means to define an injury. AES is the diagnostic imaging technique of choice for providing information on the integrity of the internal and external anal sphincters and detecting sphincteric defects with a reported accuracy of 90 to 100%.[16,17]

Equipment

The most often used ultrasound machine displays a 360- degree image made possible by a mechanically rotating transducer on a hand probe. The 5-15 MHz transducer provides the clearest images.

Technique

The only preparation is a small enema. Sedation is not necessary. The patient is placed in the left decubitus position. The ultrasound system is assembled, and water is introduced to fill the cap covering the transducer. Air bubbles must be removed, because they cause an artifact. A digital examination is performed to find abnormality, but also to define the direction for insertion of the probe. The probe is introduced blindly to the point where the transducer is in the rectum. Images are made in the upper, middle, and distal anus, which is the distal 4–5 cm.

Image Interpretation

1. Anal canal

Bartram[ref] describes six ultrasonographic layers in the anal canal.

l) a hyperechoic layer that is the interface of the cone with the tissues;

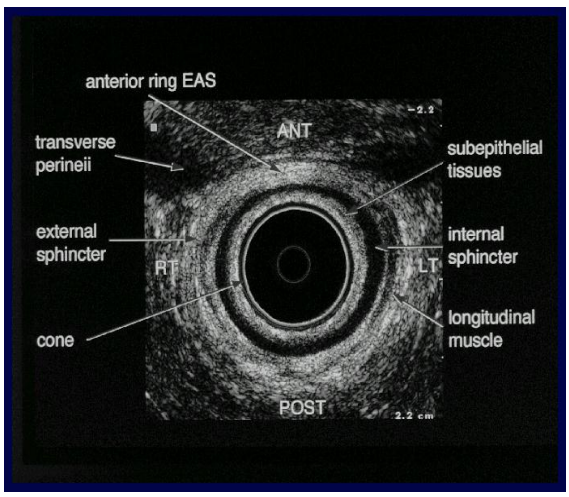
2) a hypoechoic layer that represents the mucosa.

3) a hyperechoic layer that represents the submucosa.

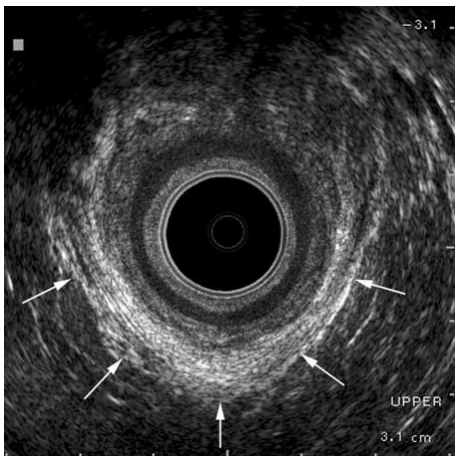
4) a hypoechoic layer that is the internal anal sphincter.

5) a hyperechoic layer that represents the intersphincteric plane and the longitudinal muscle; and,

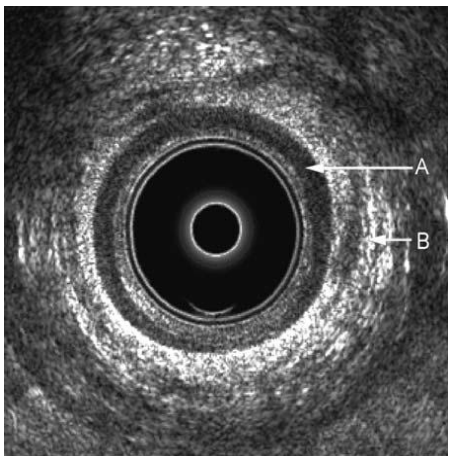
6) a layer of mixed echogenicity representing the external anal sphincter.



In the upper anal canal, the puborectalis muscle is seen to loop around the upper anus. In the middle anus, both the internal and external sphincters may be seen. In the distal anus, the subcutaneous portion of the external sphincter is visualized, but the internal sphincter does not extend this far. The thickness of the internal sphincter stands out in the middle of the anus. The normal adult sphincter is 2–3 mm thick. A neonate may have a sphincter of 1 mm, and in the elderly 3–4 mm thick.



(a)



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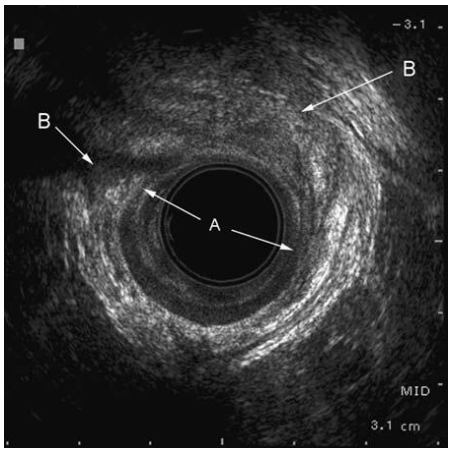

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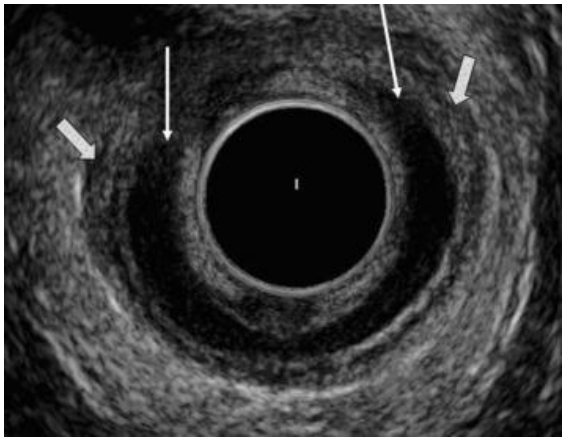


(d)

Figure shows- (a). upper anal canal U shaped structure shows puborectalis sling **(b).** mid part of anal canal A- internal sphincter B- external sphincter **(c).** A- internal sphincter defect B- external sphincter defect**. (d)** internal sphincter defect(narrow arrow) ,external sphincter defect(broad arrow).

2. Rectum

Five layers of the rectal wall can clearly be visualized by endorectal sonography. The first-layer interface between the balloon and mucosa is hyperechoic. The mucosa is visible as a thin hypoechoic layer, followed by a slightly thicker hyperechoic submucosa. The muscularis propria is hypoechoic, and the perirectal tissue is hyperechoic.

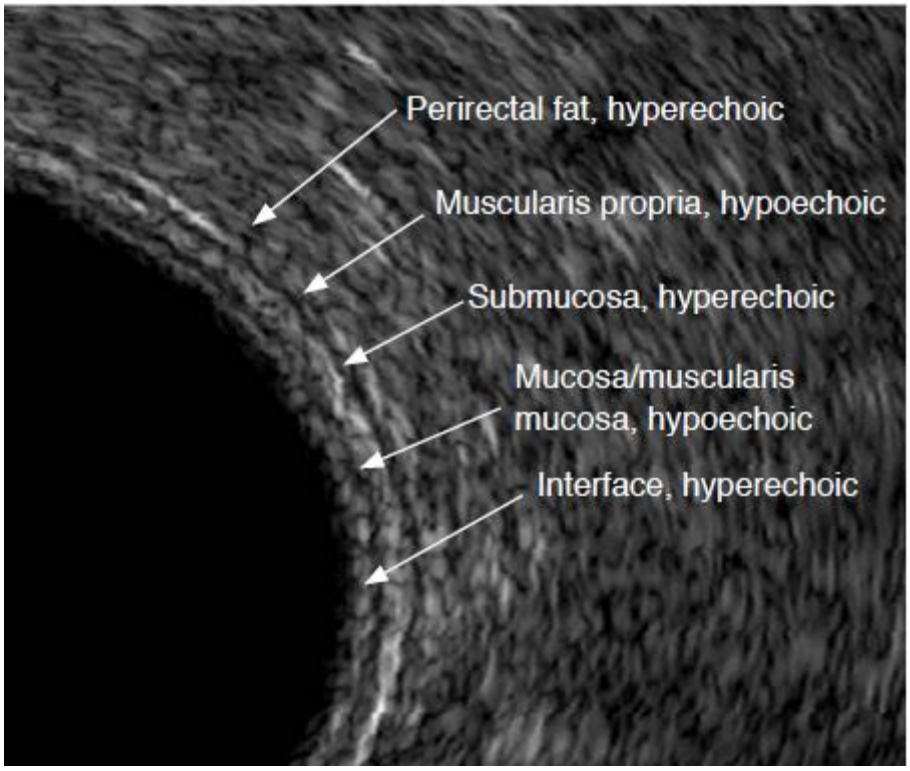


Fig: The Five Anatomical layers of Rectum demonstrated on TRUS.

No.	Anatomical Layer	Transrectal Ultrasonographic finding
1	Mucosal epithelium	Hyperechoic
2	Lamina propria and Muscularis mucosa	Hypoechoic
3	Submucosa	Hyperechoic
4	Muscularis propria (inner cercular & outer longitudinal layer)	Hypoechoic
5	Perirectal fat	Hyperechoic

Interpretation

A thin muscle suggests primary degeneration of the internal sphincter. After lateral internal sphincterotomy, a distal defect can be seen in the internal sphincter. Obstetric trauma may extend into the transverse perineus muscle, the external sphincter, or completely down through the internal sphincter. The injury blurs out portions of the normal rings of tissue.

MATERIAL AND METHODS

Thirty patients, between age group of 18-75 years, attending OPD of the SCPM Ayurvedic Medical College & Hospital Gonda, with the characteristic features of fistula in ano, were randomly selected for the present study, and divided in to three groups named as Group I, II and III. The details of the patients were collected by using a standard proforma.

Selection of patient

Patients suffering from fistula in ano coming to SCPM Ayurvedic Medical College & Hospital, Department of Shalya Tantra OPD/IPD were taken as cases in the study groups.

Grouping of the patient

For clinical study 30 patients will be grouped in three groups of 10 patients each.

Group I - Low anal fistula/ simple fistula treated with *Ksharasutra Therapy.*

Group II - Complex / high anal fistula in ano treated with *Ksharasutra Therapy.*

Group III - Recurrent fistula in ano treated with *Ksharasutra Therapy.*

Inclusion criteria

Patients diagnosed to have fistula is ano of cryptoglandular origin were randomly selected, irrespective of sex, chronicity, *prakriiti*, length of track,, type of fistula etc. and were in between the age group of 18 to 75 years.

One of the most clinically useful classification systems for perianal fistulas by the American Gastroenterological Association (Sandborn WJ, Fazio VW et.al. 2003) divides them into simple and complex.

Simple fistula

Simple fistulas are low - i.e. they involve a small (or sometimes none) portion of the sphincter complex. These fistulas include superficial, low intersphincteric or low trans-sphincteric fistulae. In addition, communication between the anal canal and skin is only *via* one tract and is not associated with inflammatory bowel disease, radiation or involving any other organs.

Complex fistulas

1) Anatomically higher

2) They involve significant portions of the sphincter musculature

3) May have multiple tracts

4) Involve other organs

5) Associated with radiation or inflammatory bowel disease. Recurrent fistulas are usually included in this category as well.

Exclusion criteria

Patients with uncontrolled diabetes mellitus, tuberculosis, biopsy of the track suggestive of malignancy, children's fistula secondary to other systemic disease like ostiomyelitis of coccyx, Ulcerative colitis were excluded from the study.

Examination of the patient

Patient selected were thoroughly examined and investigated. The history and findings were noted in proforma specially prepared for the study. The following points were given due importance.

History of the patient

History of the disease with respect to its onset, mode and duration, type of discharge, severity of pain, chronicity of the disease, bowel habits, associated disease like tuberculosis, diabetes, colitis, urinary diseases, cardiac disease , past treatments undertaken for the same disease etc., occupation, *prakriti*, nutritional status, family history and his/her personal habits and addictions were recorded carefully.

1. Systemic Examination

Each system was carefully examined before the patient was initiated into treatment. Due importance was given to examine the digestive, cardiovascular, respiratory, nervous and genito-urinary systems.

2. Local Examination

Inspection

It was one of the most important diagnostic tools required for provisional diagnosis of the type of fistula. The condition of the perianal and scrotal skin, presence of indurations, inflammation, colour of skin, quality and quantity of discharge, margins of external openings, numbers of external openings, the O'clock position, previous operated scars were observed.

Palpation

Palpation is done for local temperature, tenderness, area of indurations, consistancy etc. The fibrous cord like fistulous track, its extent and direction, presence of pus cavities etc. were also palpated.

Digital rectal examination (DRE)

DRE was done with gloved lubricated index finger to examine the presence of fissure bed, pile masses, malignant growths, polyps, blind abscess cavities, hypertrophied anal papillae, internal opening, , anorectal ring.

Proctoscopy

Proctoscopy was done routinely to identify the presence of pile masses, ulcerations, polyps, location of internal opening growth etc.

Probing

This was an important examination which provided accurate knowledge regarding-

i. The track, whether it is complete or not
ii. The extent of the track
iii. The direction of the track
iv. Position of the internal opening.
v. Relation of the internal opening to the anorectal ring
vi. Relation of the fistulous track with the sphincter muscles
vii. Branching of track
viii. Whether the track had extended to the posterior side of midline
ix. Relation, if any, to the neighboring organs.

A Soft, malleable probes were carefully passed through the external opening with care, with one finger in the rectum guiding its advancement. Care was necessary in order to have the cooperation of the patient during examination and also to avoid the creation of false track.

Investigations

Routinely the following investigations were carried out

- Blood - Hb, TLC, DLC, ESR, CT, BT, FBS, PPBS,

Blood Urea, Serum creatinine, HIV, HBsAg

- Urine - Routine and microscopic

- Stool - Ova; cyst, occult blood
- Pus - Culture and sensitivity
- Biopsy - From the floor of fistula if required
- Urograffin sensitivity test
- X- Ray - X-ray chest PA view

-X-ray pelvis to exclude any bony pathology

-Fistulogram with urograffin

- ECG

Assessment of anal continence

Anal incontinence was assessed by using questionnaire (wexner scoring system), DRE, Trans Rectal Ultrasonography (TRUS).

1. Questionnaire – scoring system (cleveland Clinic from oliveka et a! 1996)

Incontinence	**Never**	**<1/month**	**<1/week to 1/month**	**<1/day to 1/week**	**daily**
	0	1	2	3	4
Flatus					
Liquid					
Solid					
Use of pad					
Alteration of life style					

0 – no incontinent

20 – complete incontinent

2. Digital Rectal Examination- clinical assessment of sphincter tone done by DRE

Sphincter tone	
Normal	
Hypotonic	
Hypertonic	

3. Transrectal Ultrasound (TRUS): Technique

It is very important that the rectum is empty and clear prior to examination because residual stool can deteriorate image quality and impede interpretation. One or two small volume enemas 2 hour prior to examination are usually effective. The patient is placed in the left lateral decubitus position and careful inspection of the perianal region followed by digital examination of the anal canal and rectum. Digital rectal examination is very useful and should be performed routinely as a first step in TRUS imaging. It provides useful information

about anatomy of the anal canal, presence of scars and stenotic lesions that could preclude insertion of the endosonic probe. Thorough digital examination can evaluate the size, location, morphology and fixation of rectal lesion. Moreover, gentle anal dilatation during the examination allows painless insertion of the probe into the rectum. The probe should be prepared before insertion by placing a small balloon over the transducer head and secured with metal ring. The assistant holds the probe with the balloon in the most dependent position and fills the balloon with 40–50 ml of water with the syringe attached to the spigot at the base of the metal shaft. Entrapped air in the system is then aspirated together with water via the same syringe. This procedure is repeated as long as the whole system becomes air free. It is very important because even very small residual air bubbles in the balloon can make large artifacts and prevent high-quality imaging. The probe is then lubricated with water-soluble lubricant (ultrasound gel) and inserted into the anal canal. Imaging is typically begun at 16 MHz for better definition of the near field. The frequency may then be lowered during the examination to evaluate deeper components of fistulas or to evaluate structures beyond the anal sphincters. Probe is introduced into the rectum, aligned in standard orientation (with anterior end uppermost or 12 O' clock, 3 O' clock represent the patient's left side, 6 O' clock represents patient's posterior side and 9 O' clock represents patient's right side), and then slowly withdrawn down the anal canal until the hyperechoic puborectalis muscle, used as a landmark, is seen. After appropriate orientation to the relevant anatomic and pathologic landmarks, serial 360° images of the anal canal are obtained at 0.5-cm intervals from the anal opening to the level of the anorectal junction. A 3D volumetric image of the entire anal canal is then obtained, the craniocaudal extent of which is determined by the extent of fistulous disease identified.

The transducer is removed, and cannulation of any external openings that may exist is performed. A 3-mL syringe containing 3% hydrogen peroxide is connected by feeding tube. The feeding tube is then inserted into the external opening. Firm probing may occasionally be necessary to introduce the catheter if it has temporarily sealed over at the skin. Once cannulation is complete, the ultrasound probe is reinserted into the anal canal. Sequential images are then obtained during slow manual injection of 1-2 ml hydrogen peroxide, allowing sufficient time for passage of hydrogen peroxide along the fistula tracks. Care must be taken to prevent peroxide from refluxing onto the perineum, since this can result in peroxide being carried into the anal canal with movement of the probe and can simulate a

false internal opening. Representative images are again obtained along the length of the anal canal and are followed by a 3D volumetric image targeted to the area of interest.

Clinical indication

- FISTULA IN ANO
- PERIANAL ABSCESS
- FECAL INCONTINENCE
- ANAL NEOPLASM
- RECTAL NEOPLASM
- PROSTATE CANCER
- RECTO VAGINAL FISTULA

Image Interpretation

Normal anatomy

The 4 anatomical layers demonstrated on TRUS

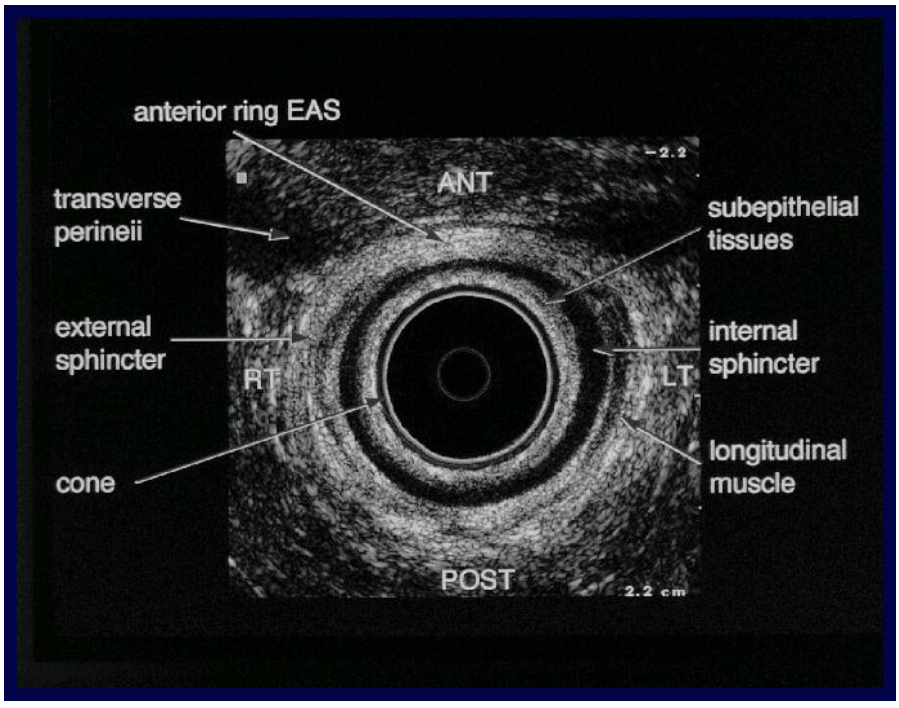
1-plastic cone

2-subepithelial layer

3-internal anal sphincter

4-conjoint longitudinal muscle layer

5-external anal sphincter (most difficult structure to identify on TRUS)



Plastic cone- It produces an inner well defined ring of high reflectivity.

Subepithelium- It is composed of connective tissue with added elements of smooth muscles derived from the longitudinal layer of the rectum and anal canal.

Internal Anal Sphincter- The internal anal sphincter forms the innermost muscular layer and is the terminal condensation of the circular rectal smooth muscle. It extends from the anorectal junction to 1 cm bellow dentate line. The internal anal sphincter is seen as hypoechoic symmetric ring. It is the best seen in the middle part of anal canal where it is thickest and is uniform hypoechoic. The thickness of internal anal sphincter measured at 3 o'clock or 9 o'clock position where muscle is symmetrical. Internal sphincter thickness increases with age but is thinned in patients with idiopathic degeneration and abnormally thick in patients with solitary rectal ulcer syndrome.

One can consider any internal sphincter thickness measurement in adults to be abnormal if it is less than 2mm or more than 4 mm, regardless of patient age. Internal anal sphincter thickness increases while external anal sphincter decreases with advancement of age.

Conjoint longitudinal muscle layer- It is thick band of muscle that passes between IAS and EAS. It is seen as a layer of similar reflectivity to the sub epithelial layer.

External Anal Sphincter

The external anal sphincter is outermost muscle of the distal anal canal. It is a circular structure and is shorter anteriorly in women. It extends approximately 1 cm beyond the internal anal sphincter. Deep part of the external anal sphincter is fused with or intimately related to the puborectalis muscle. Anteriorly it is closely related to the superficial transverse muscle of the perineum and perineal body which is seen as hypoechoic anterior region on the TRUS. EAS is composed of striated muscle. It has a different appearance in men and women.

The muscle bulk of the EAS is thicker and better defined in men. In women the EAS tend to be of higher reflectivity, which is often indistinguishable from the conjoint longitudinal layer. Both anal canal and EAS are significantly shorter in women than men.

The external anal sphincter classically shows fibrillar pattern of fine parallel hyperechoic lines in proximal third of the anal canal (deeper part of external anal sphincter) which become more homogeneous at distal third of the anal canal (superficial or subcutaneous part of

external anal sphincter). Although the external sphincter, intersphincteric plane, and longitudinal muscle are each relatively heterogeneous, using 5-15 MHz transducers, allows these to be distinguished.

Between two cylindrical layers of the both sphincters is a intersphincteric space and is visible on EUS as hyperechoic band Inside this hyperechoic intersphincteric space can be seen hypoechoic longitudinal muscle. Because of that, intersphincteric space is of mixed echogenicity. Longitudinal muscle in the intersphincteric space is continuation of the rectal wall. It is closely related to the subcutaneous part of external anal sphincter. Measurements of a muscle thickness are clinically important because they are central do diagnosis of sphincter atrophy. EUS enables reliable measurement of only internal sphincter thickness Perineal body separates the anus from the vagina in women. It is the central portion of the perineum where the external anal sphincter, the bulbospongious and the superficial and deep transverse perineal muscle meet. The presence of a thick, contractile perineal body is suggestive of a normal anal sphincter complex.

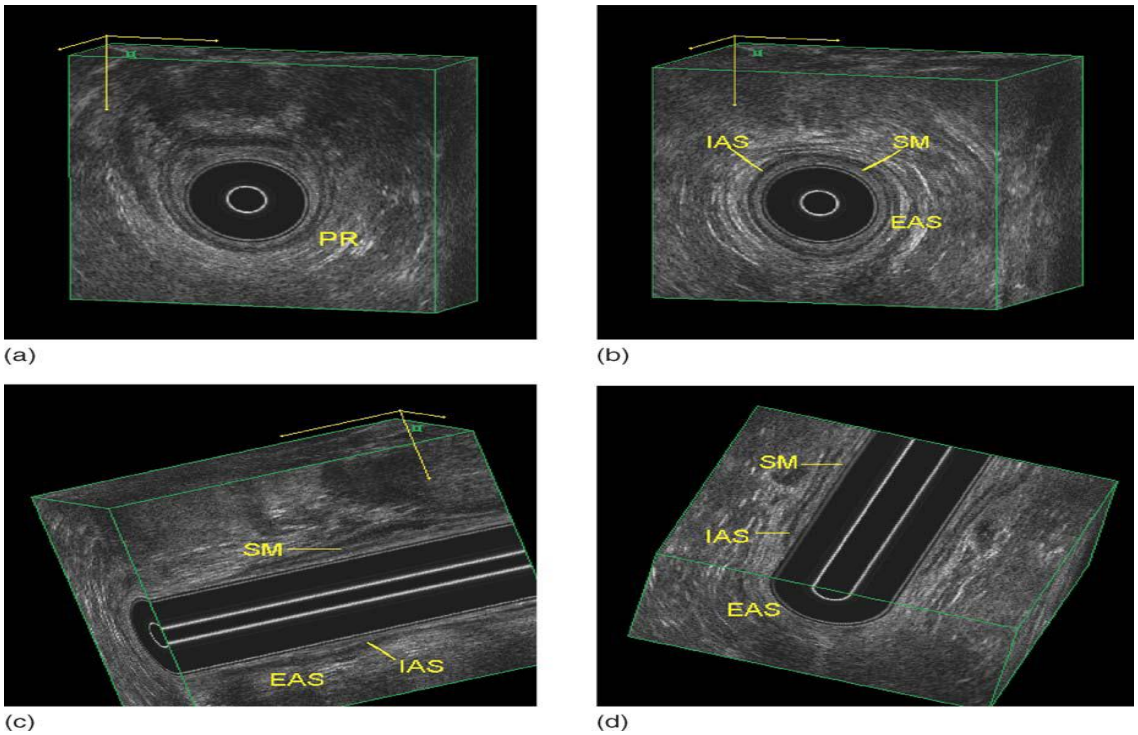


Fig. Normal anatomy of anal sphincter and puborectalis muscle in 3D image (a) Axial view of puborectalis muscle (PR) (b)-Axial view of anal sphincters (c) Sagittal view and (d) Coronal view. SM-Submucosa. IAS-Internal anal sphincte, EAS-External anal sphincter.

Imaging of fistula in ano

Park's has classified perianal fistulae as intersphincteric, transsphincteric, suprasphincteric and extrasphincteric. To reduce the risk of postoperative fecal incontinence and recurrences, it is important to identify the anatomic course of the fistula in relation to the anal sphincters. Furthermore, secondary extensions must be detected to reduce the risk of recurrence.

With proctological examination and probing of the fistula, accurate assessment is not often possible. Fistulography is an absolute technique.

The use of contrast agents like hydrogen peroxide has significantly improved the results of endosonography in the assessment of perianal fistulae. The infusion of hydrogen peroxide generates the formation of small air bubbles and this changes the fistula track from hypoechoic to bright hyperechoic ('white'). Hydrogen peroxide-enhanced endosonography must be considered a safe, economic and reliable anatomic course of procedure for the assessment of perianal fistulas. It assists in delineating the anatomic course of perianal fistulas and is therefore of value in planning surgical strategy.

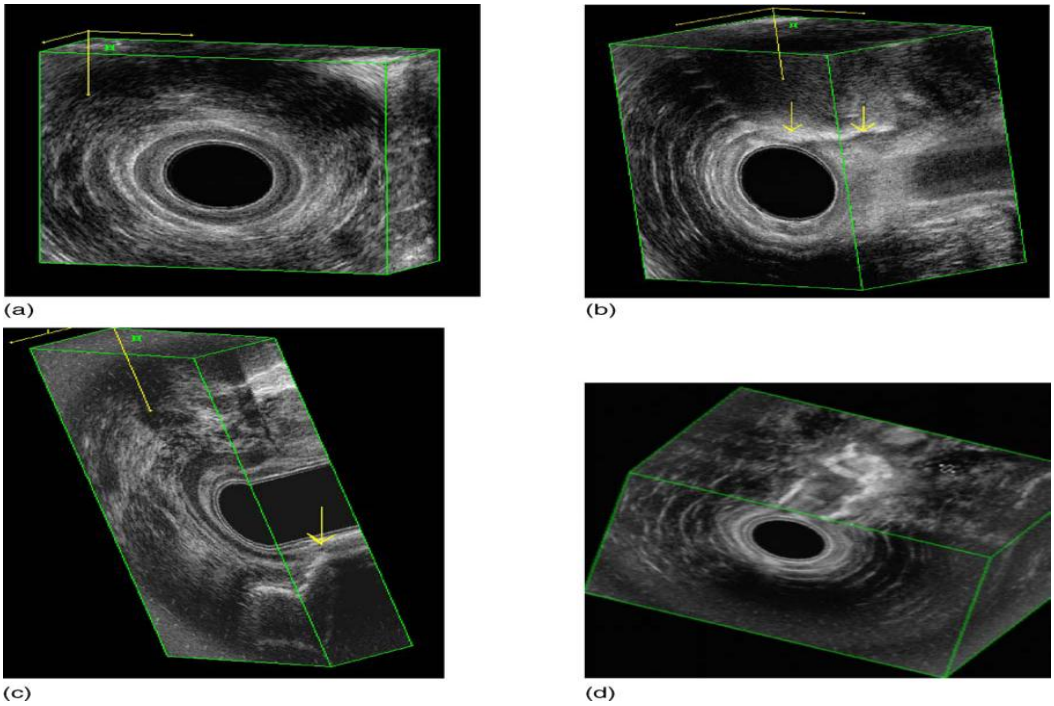


Fig. (a) Normal image of patient with fistula in ano, (b) Same patient ,after infusion of hydrogen peroxide through external opening reveals a white transsphincteric fistula(arrow) (c) transsphincteric fistula .internal opening indicated with an arrow and (d) complex horse shoe fistula with suprasphincteric extension in a patient with crohn's disease.

Treatment

Out of 30 patient 10 patients were treated with Conventional technique of *Ksharasutra* therapy and rest are treated with both conventional and modified technique of *Ksharasutra* therapy i.e. IFTAK (Interception of Fistulous Tract with Application of *Ksharasutra*).

Follow up of the patients

Patients will be followed up in a period of 6 month after completion of treatment and trans-rectal ultrasonography will be done after completion of.

OBSERVATION AND RESULTS

All 30 patients of fistula in ano were analyzed for age, sex, habitat, socio-economic status, Transrectal ultrasound, qutionarae etc. This information were observed and recorded.

Table 1: Distribution of cases According to Sex.

Sex	Number of patients	Percentage (%)
Male	27	90
Female	3	10
	30	100

In this study majority of cases were males (90%) as compared to female (10%).

Table 2: Distribution of cases According to *Prakriti.*

Prakriti	Number of patients	Percentage (%)
Vata - Pittaj	4	13.33%
Pitta - Kaphaj	16	53.33%
Kapha - Vataj	10	33.33
Total	30	100

In this study, majority number of patients belonged to *pitta-kaphaja prakriti* (53.33%) as compared to *Kapha–vataja prakriti* (33.33%) and *vata-pitta* (13.33%).

Table 3: Distribution of cases According to Habitat.

Habitat	Number of patients	Percentage (%)
Rural	17	56.66%
Urban	13	43.33%
Total	30	100

In this study, majority of cases belonged to rural area (56.66%) as compared to urban area (43.33%).

Table 4: Distribution of cases According to Food Habit

Food Habit	Number of patients	Percentage (%)
Vegetarian	12	40%
Mixed diet	18	60%
Total	30	100

In this study majority of the patients was mixed food habit (60%) as compared to vegetarian (40%).

Table 5: Distribution of cases According to Bowel Habit.

Bowel Habit	Number of patients	Percentage (%)
Normal	9	33.3
Constipation	19	63.3
Mucous mixed	2	3.3
Total	30	100

It is observed that majority of the patients (63.3%) suffered from constipation and few patients (3.3%) had mucous mixed stool. Whereas 33.3% patients were normal bowel habit.

Table 6: Distribution of cases According to Age.

Age (in years)	Number of patients	Percentage (%)
< 20	1	3.3
21 – 30	8	26.7
31 – 40	8	26.7
41 – 50	10	33.3
> 50	3	10
Total	30	100

Majority of the patients belonged to the age group of 31-50 years (60%) and patients below the age 20 years were in least numbers (3.3%).

Table 7: Distribution of cases According to chronicity of disease.

Duration (in year)	Number of patients	Percentage (%)
< 1	8	26.7
1 -3	14	46.7
> 3	8	26.7
Total	30	100

Chronicity of the disease varied from 1 week to many years. Majority of the patients had fistula in ano with a chronocity ranging from 1 to 3 years (46.7%). Patients having a history of chronicity to greater than 3 years were in minority (26.6%).

Table 8: Distribution of cases According to marital status.

Marital status	Number of patients	Percentage (%)
Unmarried	7	23.3
Married	23	76.7
Total	30	100

In this study majority of patients were married (76.7%) whereas only 23.3% of patients were unmarried.

Table 9: Distribution of cases According to socioeconomic status.

Socioeconomic status	Number of patients	Percentage (%)
Poor	16	53.3
Middle	11	36.7
Affluent	3	10
Total	30	100

In this study, it was observed that majority of the patients (53.3%) belonged to the poor class families followed by those belonging to middle class (36.7%).

Table 10: Distribution of cases According to occupation.

Occupation	Number of patients	Percentage (%)
Farmer	8	26.7
Businessman	6	20
Office Job	4	13.3
Teacher	3	10
Student	4	13.3
House wife	1	3.3
Others	4	13.3
Total	30	100

In this study, it was osberved that majority of the patients belongs to farmer (26.7%) followed by those led a sedentary life among which businessman (20%) and office job (13.3%).

Table 11: Distribution of cases According to variety of *Bhagandara*

Type of *Bhagandara*	Group I		Group II		Group III		Total case	Total (%)
	Cases	%	Cases	%	Cases	%	Cases	
Shatponaka	-	-	1	10	1	10	2	6.7
Ushtragreeva	2	20	3	30	4	40	9	30.0
Parishravi	-	-	2	20	2	20	4	13.3
parikshepi	-	-	3	30	1	10	4	13.3
Sambukavarta	-	-	1	10	2	20	3	10.0
Riju	8	80	-	-	-	-	8	26.7
Total	10	100	10	100	10	100	30	100

In this study cases representing all the varieties of *bhagandara* mentioned in the *Ayurvedic* classics were found. Majority of the cases were of the *Ushtragveera* variety (30.0%) and least

number of cases belonged to the *shatponak* (6.7%).Whereas in group I majority of cases are *Riju* variety (80%).

Table 12 : Distribution of cases based on the variety of fistula in ano.

Variety of Fistula	Group I		Group II		Group III		Total case	Total (%)
	Cases	%	Cases	%	Cases	%	Cases	
Low anal Intersphincteric	8	80	0	0	1	10	9	30.0
Low Transsphincteric	2	20	0	0	0	0	2	6.6
High Intersphincteric	0	0	2	20	2	20	4	13.3
Intersphincteric with suprlevator extension	0	0	2	20	1	10	3	10.0
High Transsphincteric	0	0	1	10	3	30	4	13.3
Blind track Transsphincteric	0	0	4	40	1	10	5	16.7
Horseshoe	0	0	1	10	2	20	3	10.0
Total	10	100	10	100	10	100	30	100

In this study, majority of the cases in group I were low track intersphincteric (80%) variety.whereas in group II majority of cases were blind track transsphincteric (40%) and high intersphincteric (20%). In group III majority of the cases were high transsphincteric (30%) whereas high intershincteric and high horse shoe shape were equel in number (20%).

Table 13: Distribution of cases based on the track.

Fistula Track	Group I		Group II		Group III		Total case	Total (%)
	Cases	%	Cases	%	Cases	%		
Blind external	1	10	3	30	3	30	7	23.3
Blind internal	1	10	2	20	0	0	3	10
Complete	8	80	5	50	7	70	20	66.7
Total	10	100	20	100	20	100	30	100

It was observed that majority of the fistula track were complete (66.7%) whereas blind internal (10%) were least number.

Table 14: Distribution of cases based on posiiton of internal opening.

Position of Internal Opening	Group I		Group II		Group III		Total Cases	Total (%)
	Cases	%	Cases	%	Cases	%		
Midline Posterior	4	40	6	60	5	50	15	50
Midline Anterior	3	30	3	30	4	40	12	40
Lateral	3	30	1	10	1	10	3	10
Total	10	100	10	100	10	100	30	100

In this study, majority of the fistula cases had middline posterior (50%) internal opening wereas lateral (10.0%) were few number of cases.

Table 15: Distribution of cases based on number of external opening.

External Opening	Group I		Group II		Group III		Total case	Total (%)
	Cases	%	Cases	%	Cases	%		
Single	10	100	7	70	8	80	25	83.33
Multiple	-	-	3	30	2	20	5	16.66
Total	10	100	10	100	10	100	30	100

It observed in this study that majority of the cases had single extenral fistulous opening (88.3%) wereas multiple openings were present in only 16.7% of the patients.

Table 16: Distribution of cases based on the number of previous surgeries in group-III.

No. of Previous Surgeries	Group I		Group II		Group III	
	Cases	%	Cases	%	Cases	%
Once	-	-	-	-	5	50
Twice	-	-	-	-	4	40
> Twice	-	-	-	-	1	10
Total	-	-	-	-	10	100

It was observed that majority of the cases had undergone surgery once (50%) before coming to Kshara sutra therapy followed by those who had undergone surgery twice (40%) before coming to Kshara sutra therapy.

Table 17: Distribution of cases based on the type of Ksharasutra therapy.

Type of *Ksharasutra* therapy	Group I		Group II		Group III		Total case	Total (%)
	Cases	%	Cases	%	Cases	%		
Classical Technique	10	100	2	20	2	20	14	46.7
IFTAK	0	0	8	80	8	80	16	53.3
Total	10	100	10	100	10	100	30	100

In this study all the patients of gorup I were treated with classical technique of kshara shutra therapy where as majority of the patients in group-II (80%) and group-III (80%) were treated with IFTAK (Interception of Fistulous Tract with Application of Kshara Sutra) technique.

Table 18: Result of pre and post therapy sphinctor tone in group 1 based on Digital Rectal Examination.

Sphinctor Tone	Pretherapy		Posttherapy	
	Case	%	Case	%
Normal	6	60	9	90
Hypertonic	4	40	1	10
Hypotonic	0	0	0	0

In this study in group I on digital rectal examination of sphinctor tone in it observed that majority of patient were normal tone (60%) before therapy and also normal tone (90%) after

therapy. Whereas few patients were hypertonic before therapy (40%) shift to normal after therapy.

Table 19: Result of pre & post therapy sphincter tone in group II based on Digitial Rectal Examination.

Sphinctor Tone	Pretherapy		Posttherapy	
	Case	%	Case	%
Normal	6	60	9	90
Hypertonic	4	40	1	10
Hypotonic	0	0	0	0

In this study, group II majority of patient were normal sphinctor tone (60%) before therpy and also Normal tone (90%) after therapy,in few patients who had hypertonic before therapy (40%) were gets normal tone after therapy.

Table 20: Result of pre and post theray sphincter tone in group III based on Digital Rectal Examination.

Sphinctor Tone	Pretherapy		Posttherapy	
	Case	%	Case	%
Normal	7	70	7	70
Hypertonic	2	20	1	10
Hypotonic	1	10	2	20

It observed that, in group III majority of the patients were normal sphinctor tone before therapy (70%) and after therapy (70%) whereas few patients were hypotonic before therapy (10%) and after therapy (20%).

Table. 21: Result of Transrectal ultrasound.

Anal sphincter disruption	Group I		Group II		Group III	
	Cases	%	Cases	%	Cases	%
IAS	7	70	6	60	4	40
EAS	0	0	0	0	0	0
Both	0	0	4	40	6	60
No anal sphincter injury	3	30	0	0	0	0
Total	10	100	10	100	10	100

It is observed that in group I (low anal fistula)in 30% patient no sphincter disruption and in 70%patients lower part of IAS was disrupted.

In group II in 60% patients part of IAS was disrupted and in 40% patients both IAS &EAS disruption was observed.

In group III in 40% cases only IAS disruption and in 60% cases both IAS & EAS disruption was present.

Table 22: Incontinence status of group II patients on the basis of scoring system.

Incontinence	Pretherapy		Posttherapy	
	Case	Score	Case	score
Flatus	-	-	1	(2)
Liquid	-	-	-	-
Solid	-	-	-	-

In this study it was observed that in group II majority of the patients were no incotinence whereas one patient for gas of score (2) after therapy.

Score

0 - never

1 - <1 times/month

2 – 1times/month-<1times/week

3 – 1times/week-<1times/day

4 – daily

Table 23: Incontinence status of group III patients on the basis of scoring system.

Incontinence	Pretherapy		Posttherapy	
	Case	Score	Case	score
Flatus	0	-	0	-
Liquid	0	-	1	2
Solid	0	-	0	-

In group III it obseved that no patient was incontinence for flatus and liquid before therapy whereas 1 patient was incontinence for flatus score 2.

Table 24 : Result of recurrence rate in fistula in ano

Recurrence	Group I		Group II		Group III	
	Cases	%	Cases	%	Cases	%
No recurrence	10	100	9	90	9	90
Recurrence	0	0	1	10	1	10
Total	10	100	10	100	10	100

In this study there is no recurrence in group I whereas 10 % recurrence in group II and group III.

CONCLUSION

An assessment of anal sphincteric injuries is done by transrectal ultrasound along with wexner scoring system.

After keen observation we reached to the following conclusions.

- In the clinical study the incidence of the disease was higher in males.
- The disease affected *Pitta-kaphaja prakriti* patients to a greater extent.
- Patients of the age group 31-50 years were affected by the disease in the greatest proportion.
- Most of the patients belonged to the rural areas.
- Greater percentages of patients affected by the disease have been found habituated to a mixed food habit.
- Constipation was a common problem in those suffering from this disease.
- People in an occupation, involving sedentary lifestyle, are mostly affected by this disease.
- Maximum numbers of patients have reported a chronicity of 1- 3 years of the disease.
- *Ushtragreeva* variety of *bhagandara* is the most common variety.
- Most of the fistula in ano have Complete, compared to blind internal or blind external tracks.
- Among the varieties of flstulae in comparison to the sphincter, the intersphincteric and transsphincteric variety of flstula is the commonest.
- In complex fistula blind transsphincteric is most common variety.
- Single external opening are found in maximum number of cases.
- Once and twice previous surgical history was found in most of the cases of recurrent fistula.
- Posterior midline fistulas are most common in present study.
- Anal endosonography, or endoanal ultrasound (EAUS) was introduced by Law and Bartram in 1989 as “a quick and minimally invasive technique for obtaining high-resolution images of the anal canal and surrounding structures.
- Studies demonstrated a high level of accuracy of EAUS in the characterization of anal fistulas, with diagnostic accuracy ranging from 63 to 94% for classification of the primary track and with accuracy of prediction of site of the internal opening as high as 93%.
- Use of hydrogen peroxide increases accuracy up to 95% for classification of primary fistulous tract and also identification of the site of the internal opening.

- Endo-anal ultrasound is done to detect the defects like fecal incontinence and atrophy. It is also used to demonstrate the perianal fistulae, perianal abscess, fistulous tract, rectal and anal carcinomas for staging and also in follow-up of the patient.
- Digital rectal examination is performed routinely as a first step in ERUS imaging.
- No major incontinence was observed in complex fistula.
- There was no incontinence case observed in group I after *Ksharasutra* therapy.
- 15% (10% for flatus and 5% for liquid stool) minor incontinence were observed in recurrent complex fistula before therapy whereas 20% (10% for flatus and 10% for liquid stool) after *Ksharsutra* therapy.
- 5% major incontinence observed in recurrent fistula.
- 5% recurrence rate observed in complex fistula and recurrent fistula in ano after *Ksharasutra* therapy.
- No shortening of anal canal length was observed in low anal fistula after therapy.
- Significant reduction in length of anal canal in complex fistula after therapy.
- All the patients of low anal fistula can be successfully treated by conventional technique of *Ksharasutra* therapy.
- Modified technique of *Ksharasutra* therapy i.e. IFTAK (Inteception of Fistulous tract with application of *Ksharasutra)* is better technique than other surgical procedure for the management of complex and recurrent fistula in ano.
- *Ksharasutra* treatment did not require long hospitalization where as the average hospital stay following surgery varied from 3 to 16 days.
- *Ksharasutra* appears to be the best option for the management of high anal fistula and recurrent fistula where there were no post treatment major incontinence and least recurrence rate (5%). Further there was no significant injury to anal sphincter was observed.

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