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Radio-Diagnosis

ROLE OF MRI OVER TRANS PERINEAL ULTRASOUND IN PERIANAL FISTULAS

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ABSTRACT A fistula-in-ano is defined as tract lined by granulation tissue which may have external opening, internal opening or both external and internal openings. Fistula has a tendency to recur specially in complex cases usually due to missed or undetected sepsis at the time of examination or surgery(12). A correct identification and understanding of the anatomical course of primary, secondary tracks and abscesses is a prerequisite for the successful management of fistula.

Study depicts Trans perineal ultrasonography (TPUS) and MR imaging for location of the fistulous track, its relationship to pelvic floor, the sphincter complex and in the identification of secondary tracks and abscesses.

MRI has become the method of choice for evaluating perianal fistulae due to its ability to display the anatomy of the sphincter muscles orthogonally, with good contrast resolution. In this study we gave an outline of classification, present a pictorial assay of sphincter anatomy and the MRI findings in perianal fistulae.

Complex and recurrent fistula cases should undergo a preoperative imaging to reduce the chances of recurrence(2). MRI is recommended as the imaging modality of choice for such cases. However transperineal ultrasonography (TPUS) also can be a good option for simple sinus tracts and fistulas because of its rapidity and availability.

MRI is feasible and effective over transperineal ultrasonography (TPUS) for the evaluation of perianal fistula.

KEYWORDS : Fistulogrpahy; Magnetic Resonance Imaging; Intersphincteric Fistulae; Transphincteric Fistulae; Extrasphincteric Fistulae; Suprasphincteric Fistulae; Ramification

I. INTRODUCTION

Fistula in ano is a common condition defined by an abnormal perianal track that connects two epithelialized surfaces, usually the anal canal to the perianal skin. The treatment of fistulas requires surgery. Successful surgical management of anal fistulas requires accurate preoperative assessment of the course of the primary fistulous track and the site of any secondary extension or abscesses. Although imaging techniques played a limited role in evaluation of perianal fistulas in the past, it is now increasingly recognized that imaging techniques, especially magnetic resonance (MR) imaging, may play a crucial role.

The advantages of magnetic resonance (MR) imaging include multiplanar imaging and a high degree of soft tissue differentiation. The primary importance of MR imaging lies in its ability to demonstrate hidden areas of sepsis and secondary extensions[5].

In this article, we review the anatomy of the perianal region, aetiology and prevalence of perianal fistulas. We also discuss the role of MRI over TPUS imaging techniques in evaluation of perianal fistulas, the protocol applied at our institution to assess perianal fistulas. We then describe location of anal fistulas and the two main classification systems for perianal fistula: the Parks and the St James's University Hospital classifications. Finally, we show the MR imaging findings of perianal fistulas, present our experience over the past 2 years in 40 patients with 199 perianal fistulas, and discuss the usefulness of MR imaging in management of perianal fistulas.

II. MATERIAL AND METHODS

This prospective study had been carried out with main source of data for the study were patients from S.S. Institute of medical sciences Davangere and inputs from Dept. of Radio-diagnosis,

Dr B R Ambedkar medical college, Bangalore and Phoenix hospital Bangalore. The study period was 2 years (May 2020 to May 2021).This study is based on prospective analysis of 40 patients with clinical diagnosis of perianal fistulae. This MRI preoperative analysis of perianal fistulae revealed total 40 patients with fistulous tract. The purpose of this study is to provide an overview of pelvic MRI for the evaluation of perianal fistulas, with a description of the technique, illustration of relevant normal anatomy, and examples of various fistula types.

Study Design: Prospective observational study.

Study Location: This was a tertiary care teaching hospital based study done in SS institute of medical sciences, Davangere, Karnataka.

Study Duration: May 2020 to May 2021

Sample size: 40 patients.

Subjects & selection method: The study population was drawn from patients who presented to SS institute of medical sciences, Davangere with Perianal region discharge and Pain, underwent TPUS and MRI between from May 2020 to May 2021.

Inclusion Criteria:

1. Patients with perianal discharge and pain
2. Either sex

3. Aged ≥ 18 years,

Exclusion Criteria:

1. Patient having history of metallic implants insertion, cardiac pacemakers and metallic foreign body in-situ.
2. Pregnant women
3. Patient having history of claustrophobia.

Procedure methodology:

After written informed consent was obtained were subjected to routine transperineal ultrasound using high frequency superficial linear probe (5 to 12 Mhz) for transperineal approach and Anal MR imaging at our institution was carried out on a 1.5-T MRI system (GE Signa Excite 1.5T) using an 8-channel phased-array coil. The sequences evaluated were given in Table no 1:

Table No 1 Suggested Protocol for MR Imaging of Perianal Fistulas[13].

SEQUENCE	PLANE	TR/TE	FOV	Slice Thickness	Matrix
T2W FSE	Sagittal	3500/120	26x26	3	512x320
T1W FSE	Oblique axial	750/15	30x30	4	320x256
T2W FSE	Oblique axial	3500/140	28x28	4	512x320
FS T1W FSE	Oblique axial	700/20	30x30	4	512x256
STIR	Coronal	8500/35	35x35	4	512x512

Note- FOV = field of view, FS = fat-suppressed, FSE = fast spin-echo, LAVA = liver acquisition with volume acceleration, T1W = T1-weighted, T2W = T2-weighted, TE = echo time, TR = repetition time.

III. RESULT

In the present study, On Trans perineal ultrasonography (TPUS) evaluation and on evaluation of the MRI findings we found that – In 40 cases

- 32 patients had single tract (80%), 8 cases had multiple tracts (20%).
- 38 cases (95%) had single external opening, rest of 2 cases (5%) multiple external opening.
- 33 (82.2%) cases shows ramification.
- 26 cases (65%) intersphincteric fistulae seen. 12 cases (30%) Transphincteric fistulae seen. 2 cases (5%) extrasphincteric fistulae seen.

IV. DISCUSSION

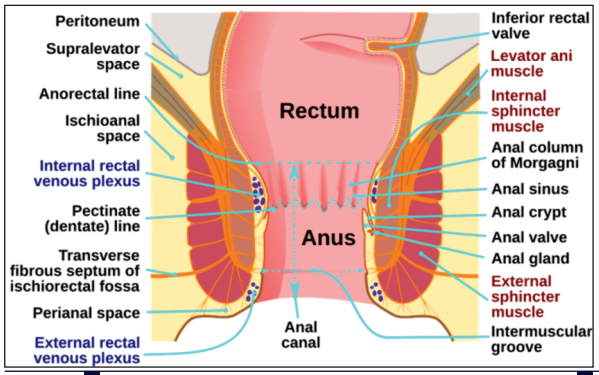
Anatomy:

The anal canal represents the terminal end of gastrointestinal tract which measures about 2.5 to 5 cm in length. Image interpretation depends on knowledge of anatomy of anal canal and anal sphincters, Figure no 1 shows graphical representation of anal canal. The anatomical anal canal extends from the perineal skin to the linea dentata. Surgically, the anal canal extends from the perineal skin to the anorectal ring.The anorectal ring lies approximately 1-1.5 cm above the linea dentata. The total length of the surgical anal canal is about 4-5 cm.

The anal sphincter is comprised of three layers:

- Internal sphincter: continuance of the circular smooth muscle of the rectum, involuntary and contracted during rest, relaxes at defecation.
- Intersphincteric space.
- External sphincter: voluntary striated muscle, divided in three layers that function as one unit.

These three layers are continuous cranially with the puborectal muscle and levator ani



Ultrasound

All patients were examined with single highly experienced radiologist in left lateral decubitus position. The patients were examined through transperineal approach to know the presence of perianal abscess or to evaluate the extra sphincteric course of perianal fistula. FIGURE 2 shows approaches of the anus with its sonographic views. In cases with perianal abscess we assessed the size, the volume, the site and extensions of abscess around and within the anal canal wall. Also, we assessed the presence of an inter sphincteric plane or submucosal localized collections.

In cases with perianal fistula we assessed the course, the thickness, the length, the side branches, the degree of surrounding soft tissue changes and eventually the site of crossing the external anal sphincter. In all ultrasound approaches images were acquired in axial and sagittal planes Final Images were analyzed to assess the whole course of perianal fistula from the position of external opening to the site of internal opening. Patients were followed up with MR imaging.

Perianal fistula could be classified according to the etiology[8], sphincteric course, extrasphincteric course, internal opening varieties, external opening varieties and the expected post-operative risks. Figures no 2-9, shows images which were acquired in axial, sagittal planes and there classification according to course).

Figure 2

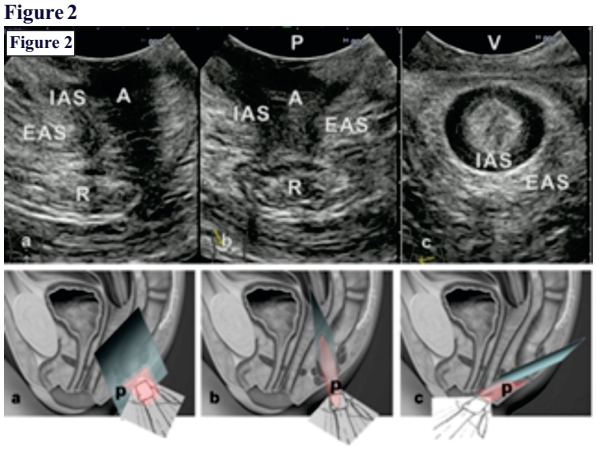


Figure 2 : Sagittal (a), coronal (b) and transverse or axial (c) approaches of the anus with its sonographic views.

Perianal anatomical landmarks: A anus, IAS internal anal sphincter, EAS external anal sphincter, R rectum, V vagina, p probe

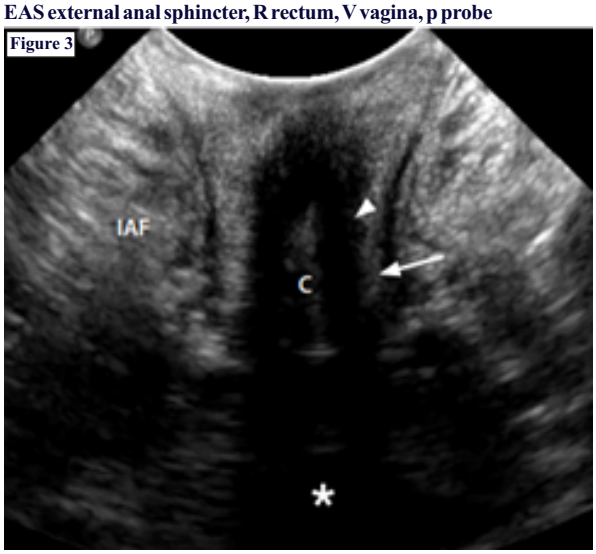


Figure 3: A coronal transperineal ultrasonogram (A) and schematic drawing (B) of the anal canal show a hypoechoic, internal anal sphincter (arrowhead) and a hyperechoic, external anal sphincter (arrow) on both sides of the anal canal ©. An ischioanal fossa (IAF) is located lateral to the external anal sphincter

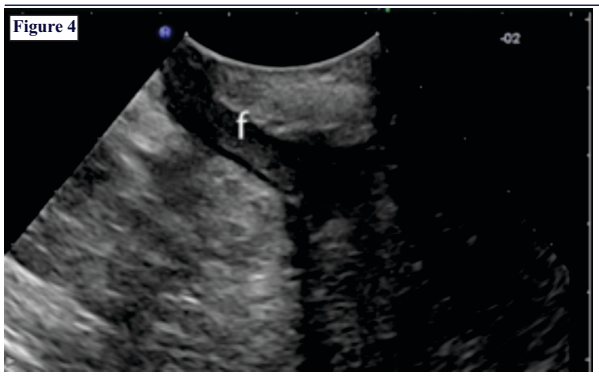


Figure 4 : Perianal fistula (f) commonly detected as hypoechoic tract. It may also contain air bubbles or a small amount of fluid and is visible between the anus or rectum and the perianal skin or vagina. F--fistula

Figure 5 : Internal opening (asterisk) of an intersphincteric fistula (F) clearly visible at 6 O'clock position hypoechoic focus with gaseous content in the intersphincteric space that abuts the internal sphincter

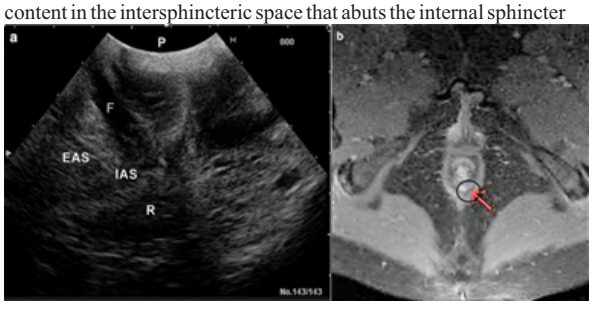


FIGURE 6: a. Sagittal or longitudinal view of an intersphincteric fistula detected as hypoechoic tracts within the internal sphincter or not exceeding 30% of the width of the external sphincter.

b. The same intersphincteric fistula at MRI; arrow fistula, F--fistula, IAS--internal anal sphincter, EAS--external anal sphincter, R--rectum

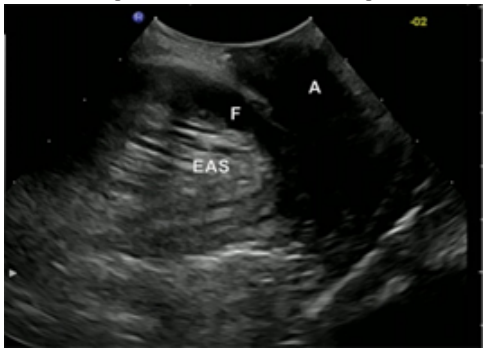


Figure 7 : Trans-sphincteric fistula as hypoechoic tracts that cross the external sphincter; F fistula, EAS external anal sphincter

Figure 8 : Extrasphincteric fistula originating just above the anorectal junction; F fistula, ARJ posterior side of the anus close to the anorectal junction, asterisk proximal tract of the fistula, A part of the anus

Figure9: Transsphincteric fistula better detected following the injection of a contrast agent (e.g., diluted hydrogen peroxide) into the external orifice; F fistula, asterisk contrast agent

Magnetic Resonance Imaging (mri):

The anal sphincter complex consists of two cylindrical layers separated by a fat-containing intersphincteric space. The understanding of perianal anatomy is important to provide an excellent road map prior to surgery. The anal sphincter complex with soft tissue density with hypointense imaging is seen on MRI as two concentric rings separated by a sheet of fat appearing hyperintense. FIGURE 10 shows normal MRI anatomy of the rectum and anus.

The major advantage of MR imaging is its capacity to demonstrate extensions associated with a primary tract[9]. Morphologically, MRI ability to accurately demonstrate the fistula's extensions may provide an excellent road map prior to surgery[4].

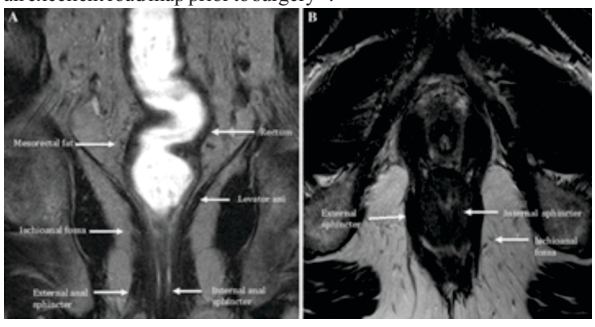


Figure 10: Normal anatomy of the rectum and anus on MRI.

(A).Coronal T2 weighted turbo spin echo (T2 TSE) image of the rectum and anus demonstrates the normal anatomic structures.

(B).Axial small field of view (FOV) T2 TSE image demonstrates the anatomy of the perineum (B)

To locate the internal opening, we adopt the anatomical surgical description of anal canal, according to "anal clock" (Figure 11 shows anal clock)

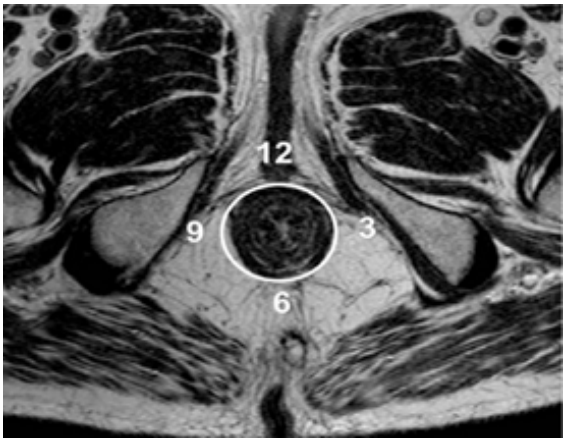


Figure 11 : Axial T2-weighted MR images shows the "anal clock". The anterior perineum is located at 12 o'clock and the posterior midline or intergluteal cleft is at 6 o'clock, while the left lateral aspect of the anal canal is at 3 o'clock and the right lateral aspect is at 9 o'clock.

Classification of perianal fistula:
I. According to the sphincteric course: the following types of perianal fistula observed

a. Submucosal fistulas (9 cases-2%):were caused by cryptoglandular. Infection or Chron's disease and were depicted in either upper or lower anal canal above or below the level of dentate line where the mucosal ligament present.

b.c. d. e. Inter sphincteric perianal fistula (26 cases- 65%) (Figure 12): May extend downward (type A), upward {type B), upward and suprasphincteric (type C) or circumferential (Horse-shoe fistula or type D). In type A the fistula tract extended in a downward direction to reach the perianal skin, in type B it extended in an upward direction with blind termination or with a second internal opening in the anorectal wall, Type C the supra sphincteric type of perianal fistula in which the track ascend in inter sphincteric plane to above puborectalis level and descend in between the puborectus and levator ani muscles to ischio anal fossa and perianal skin, In type D it extended in the circumferential direction to form a horseshoe fistula (Figure 4A, B) with its internal opening at the mid line posteriorly. Posterior inter sphincteric horse-shoe fistula can extend upward to high anal canal level without external opening, but can't extend downward due to the presence of anococcygeal ligament, the horse-shoe fistula tract also can extend to the ischioanal fossa and perianal skin.

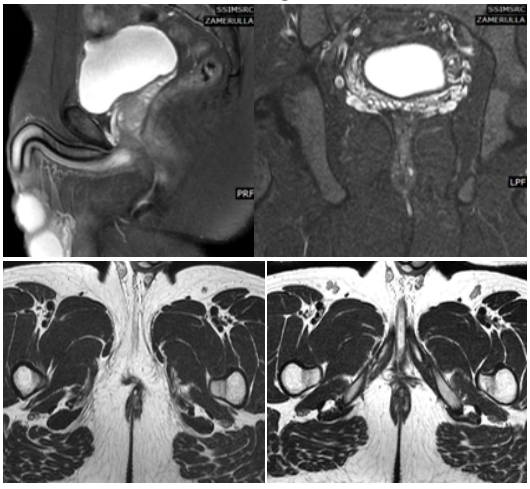


Figure 12 : Intersphinteric perianal fistula with cutaneous opening in the left gluteal region at 2' O clock position and internal anal opening at 12'O clock positionin the lower third of the anal canal.

c. Transsphincteric perianal fistula (12 cases-30%) (Figure 13) : Can be subclassified into 2 types according to the site where they cross the sphincters. Type A at or above the puborectalis muscle (36 cases-8%) or type B below the puborectalis level (279 cases-62%). In type A all perianal sphincters including the puborectalis muscle are in danger. In type B the puborectalis muscle and the deep external sphincter are spared. Each of them may show abscess formation at the ischioanal fossa.

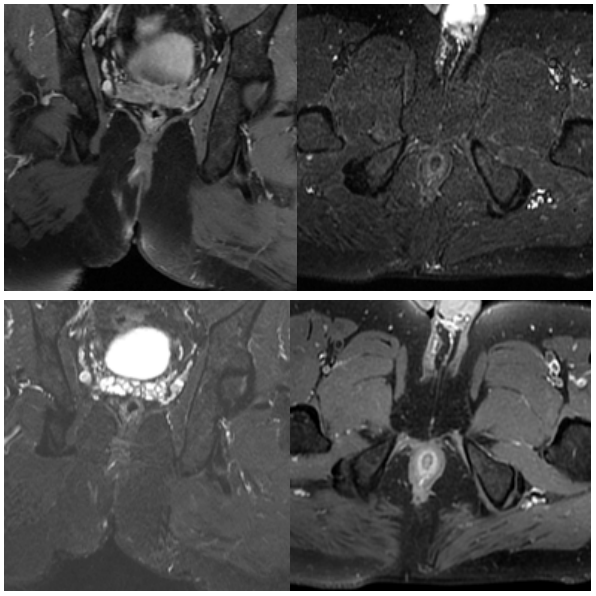


Figure13:Transsphincteric Perianal Fistula With External Opening Along The Natal Cleft With Internal Opening At 6'o Clock Position

d. Extrasphincteric fistula (2 cases-5%) (Figure 14): The fistula track pass outside the sphincters to terminate at anorectal wall, it can be caused by Crohn's disease, recurrent cryptoglandular fistula, TB, pelvirectal abscess and diverticulitis. It could be subclassified into: Type A with blind termination, type B with internal opening in rectal wall, type C with abscess near rectal wall, type D with abscess at ischioanal fossa.

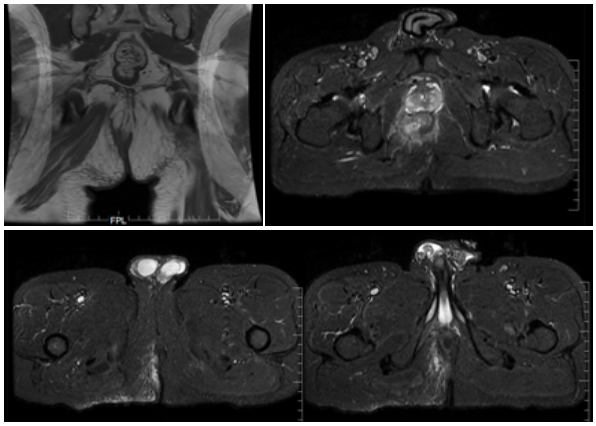


Figure 14: Long Extrasphincteric Fistula Measuring 9 Cm Length, 6 Mm Caliber Showing Mucosal Opening Of 8 Mm Focal Defect At 8 O'clock Position

2. According to the varieties of internal opening
A. The presence of internal opening:
It correctly identified the site of internal opening in 88% of cases and among the remaining 12%, 23 cases (5%) showed no internal opening could be identified at surgery. Internal opening could be present or absent either due to blockage or destruction of internal opening or could be seen as tiny holes.

B. Level of internal opening:
Below the dentate line (11 cases-2.5%), above the dentate line (45 cases-10%) or at the dentate line (371 cases- 82.5%). Fistulas with their internal openings below the dentate line were seen due to hiradenitis Suppurativa, Crohn's disease, T.B. Fistulas with their

internal openings at the dentate line were cryptoglandular in origin, Fistulas open above the dentate line may be due to crohn's disease, TB or postoperative recurrence.

C. Number Of Internal Openings:
More than one internal opening could be seen (4 cases-1%) in recurrent crypto-glandular fistulas and in crohn's disease.

3. According to the varieties of external opening:
External opening could be single or multiple. Multiple external openings could be seen with branching fistula or with multiple fistulas. External opening could be situated very close to the anal verge and suggest intersphincteric fistula or could be away from the anal verge and suggest transsphincteric or extrasphincteric fistula. It could be absent in many cases and suggest sinus tract or fistula in progress (9 cases-2%)

4. According to the postoperative risks:
Risky for postoperative recurrence: - (89 cases-20%)

The followings are at increased risks for recurrence.
- An abnormal extra sphincteric course, like multiple branches, abnormal kinks and blocking of tracks.
- Tracks with no internal opening.
- Certain types of fistulas as horse-shoe fistula, high transsphincteric, extra sphincteric and supra sphincteric fistulas.
- Some general conditions as diabetes or Crohn's disease.

V. CONCLUSION
Trans perineal ultrasonography (TPUS) approach was entirely helpful for evaluating the sphincteric course of fistula, but gives not much about the extrasphincteric course which guides the surgeon for treatment[3]. Thus made magnetic resonance imaging more acceptable technique for evaluating perianal fistula, since it provides precise location of the fistulous track and its relationship to pelvic floor and the sphincter complex. MRI helps in the identification of secondary tracks, abscesses and providing good delineation of the layer of anal sphincters. In our experience axial T2W fat – suppressed images were the most useful for locating fistulous tracts. Gadolinium enhanced T1W images are useful to differentiate a fluid filled tract from an area of inflammation.

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