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Contents

Monthly Volume 14 Number 4 April 27, 2022

DIAGNOSTIC AND THERAPEUTIC NORMS

271 Including video and novel parameter-height of penetration of external anal sphincter-in magnetic resonance imaging reporting of anal fistula

Garg P, Kaur B, Yagnik VD, Dawka S

MINIREVIEWS

276 Current status of surgical management of patients with gastroenteropancreatic neuroendocrine neoplasms

Stankiewicz R, Grąt M

286 Gastrostomy tubes: Fundamentals, periprocedural considerations, and best practices

Rajan A, Wangrattanapranee P, Kessler J, Kidambi TD, Tabibian JH

ORIGINAL ARTICLE

Retrospective Cohort Study

304 Laparoscopic-assisted *vs* open transhiatal gastrectomy for Siewert type II adenocarcinoma of the esophagogastric junction: A retrospective cohort study

Song QY, Li XG, Zhang LY, Wu D, Li S, Zhang BL, Xu ZY, Wu RLG, Guo X, Wang XX

Retrospective Study

315 How to examine anastomotic integrity intraoperatively in totally laparoscopic radical gastrectomy? Methylene blue testing prevents technical defect-related anastomotic leaks

Deng C, Liu Y, Zhang ZY, Qi HD, Guo Z, Zhao X, Li XJ

329 Clinical outcomes of endoscopic resection of superficial nonampullary duodenal epithelial tumors: A 10-year retrospective, single-center study

Cho JH, Lim KY, Lee EJ, Lee SH

CASE REPORT

341 Subacute liver and respiratory failure after segmental hepatectomy for complicated hepatolithiasis with secondary biliary cirrhosis: A case report

Fan WJ, Zou XJ

352 Surgical timing for primary encapsulating peritoneal sclerosis: A case report and review of literature

Deng P, Xiong LX, He P, Hu JH, Zou QX, Le SL, Wen SL

362 Laparoscopic-assisted endoscopic full-thickness resection of a large gastric schwannoma: A case report

He CH, Lin SH, Chen Z, Li WM, Weng CY, Guo Y, Li GD

World Journal of Gastrointestinal Surgery

Monthly Volume 14 Number 4 April 27, 2022

Contents

LETTER TO THE EDITOR

370 Imaging of acute appendicitis: Advances

Aydın S, Karavas E, Şenbil DC

World Journal of Gastrointestinal Surgery

Monthly Volume 14 Number 4 April 27, 2022

Contents

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The primary aim of *World Journal of Gastrointestinal Surgery* (*WJGS*, *World J Gastrointest Surg*) is to provide scholars and readers from various fields of gastrointestinal surgery with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, *etc*.

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DIAGNOSTIC AND THERAPEUTIC NORMS

Including video and novel parameter-height of penetration of external anal sphincter-in magnetic resonance imaging reporting of anal fistula

Pankaj Garg, Baljit Kaur, Vipul D Yagnik, Sushil Dawka

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Abstract

The main purpose of a radiologist's expertise in evaluation of anal fistula magnetic resonance imaging (MRI) is to benefit patients by decreasing the incontinence rate and increasing the healing rate. Any loss of vital information during the transfer of this data from the radiologist to the operating surgeon is unwarranted and is best prevented. In this regard, two methods are suggested. First, a short video to be attached with the standardized written report highlighting the vital parameters of the fistula. This would ensure minimum loss of information when it is conveyed from the radiologist to the operating surgeon. Second, inclusion of a new parameter, the amount of external sphincter involvement by the anal fistula. This parameter is usually not included in the MRI report. This can be evaluated as the height of penetration of the external anal sphincter (HOPE) by the fistula. The external anal sphincter plays a pivotal role in maintaining continence. This parameter (HOPE) is distinct from the 'height of internal opening' and assumes immense importance as its knowledge is paramount to prevent damage to the external anal sphincter by the surgeon during surgery.

Key Words: Magnetic resonance imaging; Anal fistula; External anal sphincter; Video reporting; Incontinence

Core Tip: There is loss of vital information when a fistula-in-ano magnetic resonance imaging (MRI) report from the radiologist is interpreted by the operating surgeon. To prevent this loss, a novel method is suggested: sending a small video highlighting vital fistula parameters along with the written MRI report. Also, another vital parameter is the amount of external sphincter involvement by the fistula. This parameter is not included in the MRI report and can be evaluated from the height of penetration of the external anal sphincter (HOPE) by the fistula. This parameter (HOPE) is distinct from the 'height of internal opening' and would help prevent damage to the external anal sphincter during surgery.

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INTRODUCTION

Anal fistulas are associated with a high rate of recurrence and risk to the anal continence mechanism. The operating surgeons need to understand the exact position of the anal fistula and its relation to the anatomical structures in order to achieve high cure rate especially in complex anal fistulas. Magnetic resonance imaging (MRI) is the gold standard investigation used for anal fistulas. Usually, the MRI is interpreted by the radiologists who then send a written report to the operating surgeon and the surgeon performs the surgery after reading the radiologist's report. Formats have been suggested for reporting the MRI in fistulas[1,2]. However, utility of MRI to the operating surgeon can be improved immensely if the two features discussed below (inclusion of an MRI video and addition of HOPE parameter) are added to MRI report (Table 1).

First, when only a written report is sent by the radiologist who has analyzed the MRI scans, then a lot of important information is lost. This happens because the three-dimensional picture created in the radiologist's mind by the detailed visual analysis of the MRI scans cannot be replicated in the surgeon's mind just by reading the text in the radiologist's report. This loss of three-dimensional visual data can be prevented by sending a small video highlighting all relevant parameters along with the written report. Second, as discussed, the two main concerns in anal fistulas are recurrence and incontinence[3]. It is a known fact that the recurrence risk of fistula is directly related to surgeon's knowledge about the precise location of fistula tract's internal opening (where the fistula opens into the anal canal)[4,5]. On the other hand, the accurate assessment of the amount of external anal sphincter (EAS) involvement is key to prevent sphincter damage (incontinence)[6]. The importance of reporting the location of the internal opening has now been established[7], but the other equally important parameter, HOPE (height of penetration of external anal sphincter by the fistula) parameter is not reported by the radiologists (Figure 1). The EAS is mainly responsible for anal continence. HOPE parameter conveys the extent of involvement of the EAS to the operating surgeon and is thus pivotal to avoid damaging the EAS. The studies have demonstrated that when the surgeon performing the surgery is unsure of the accurate extent of EAS involvement, then the fistulotomy procedure is generally avoided and remains largely underutilized, even in simple anal fistulas, due to fear of incontinence in the mind of surgeons[8]. Fistulotomy is the simplest procedure for low anal fistulas and is associated with the maximum cure rate (93%-99%) and no other procedure has been shown to have success rate comparable to fistulotomy [6,8]. Therefore, lack of knowledge of HOPE (EAS involvement) leads to a lower healing rate which can be prevented by proper MRI reporting.

As the origin of most fistulas is at the level of the dentate line, the location of the internal opening in most of them is at that level only. The location of the internal opening does not accurately correspond to the amount of involvement of the EAS as penetration of the EAS by the fistula is often at a different level (Figure 1 and Video 1). Therefore, HOPE is the parameter which should be reported separately for helping the operating surgeon to precisely assess the amount of involvement of the EAS.

The level of understanding of fistula anatomy is greatly enhanced in the surgeon's mind when a small video of MRI scan showing the fistula characteristics is send along with the written report (Video 1). The key points regarding the fistula characteristics can be highlighted by using a pointer in the video

Table 1 Format for the written magnetic resonance imaging report

Parameters	Example
Primary tract	The primary fistula tract
External opening	Is opening in perianal skin at 7 o'clock position
Course and location	It extends superiorly in right ischiorectal fossa from 7 to 8 o'clock position
Length	For a length of 6.35 cm
Location and height of penetration of EAS (HOPE)	and penetrates the EAS at 8 o'clock position involving approximately two-thirds of the EAS. It then bends inferiorly and
Intersphincteric tract	follows an intersphincteric route from 8 to 6 o'clock
Location and height Internal opening	and opens in the anal canal at the level of dentate line
Secondary extension- intersphincteric/ ischiorectal fossa/supralevator	There are no secondary extensions of primary tract
Secondary tract	There are no secondary tracts,
External opening	
Course and location	
Associated abscess	No associated abscess
Supralevator or suprasphincteric tract	And supralevator tract
Sphincter anatomy	The sphincters look normally preserved
Classification	Parks grade -II, SJUH[1] grade III

[1]SJUH- St James's University Hospital classification.

Report: The primary fistula tract is opening in perianal skin at 7 o'clock position. It extends superiorly in right ischiorectal fossa from 7 to 8 o'clock position for a length of 6.35 cm and penetrates the external anal sphincter (EAS) at 8 o'clock position involving approximately two-thirds of the EAS. It then bends inferiorly and follows an intersphincteric route from 8 to 6 o'clock and opens in the anal canal at the level of dentate line. There are no secondary extensions of primary tract. There are no secondary tracts, no associated abscess, and no supralevator tract. The sphincters look normally preserved.

Impression- A right transsphincteric high fistula involving about two-thirds of the external anal sphincter, intersphincteric tract from 8 to 6 o'clock and internal opening at 6 o'clock at the level of dentate line. No secondary tract, abscess or supralevator extensions. Parks grade -II, SJUH grade III.

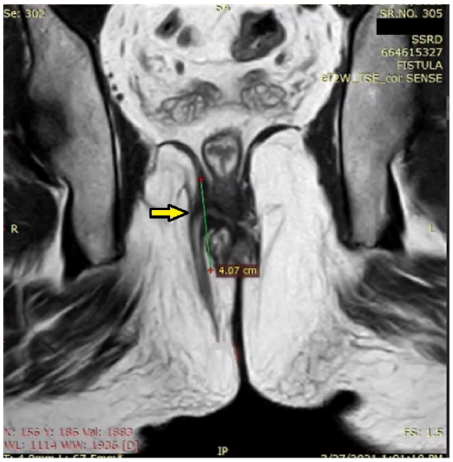

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Figure 1 Height of penetration of external sphincter parameter. Demonstration of height of penetration of external anal sphincter by the fistula tract in the patient included in accompanying video (Video 1). Approximately 2/3 of the external sphincter is involved by the fistula tract. The yellow arrow demonstrates the point of penetration of external anal sphincter by the fistula tract.

(Video 1). The fistula parameters which should be mentioned and highlighted in the video have been listed in Table 2. The MRI report should also be standardized as shown in Table 1. An example of a final written report (of the fistula shown in Video 1 has been included at the bottom of Table 1 to clarify the format).

As can be seen, the novel parameter reported in this study, HOPE (height of penetration of external anal sphincter by the fistula tract) has also been incorporated in the video (Video 1) as well as the report

Table 2 Format for reporting the fistula magnetic resonance imaging in the video

Axial Section T2-weighted
1 External opening- location
2 Define primary tracts
Location and course – Ischiorectal fossa/ Intersphincteric and clock-dial position
Location and 'height' of penetration of external anal sphincter (HOPE)- Point of penetration of external anal sphincter
Intersphincteric course
Location and height of internal opening- clock-dial position and whether it is at dentate line or higher
3 Secondary tracts
4 Associated abscesses
5 Supralevator extension
6 Additional internal opening
7 Sphincter anatomy
Axial section-STIR
1 Confirm findings of Axial-T2
2 Additional areas with inflammation
Coronal T2-weighted
1 Confirm findings of Axial-T2
2 Length of tract
3 Supralevator or suprasphincteric tract
4 Confirm the 'height' of penetration of external anal sphincter (HOPE) by the fistula tract – Indicates the amount of external sphincter involved
5 Confirm the 'height' of the site of internal opening
6 Extent of fistula tract in anterior fistulas- relation with urethra
7 Sphincter anatomy
Coronal section- STIR
1 Confirm findings of Coronal-T2
2 Good to detect thin Intersphincteric collections
Biplanar (Axial T-2 weighted + Coronal T-2 weighted)
1 Confirm the 'height' of the site of penetration of external sphincter by the fistula tract – Indicates the amount of external sphincter involved
2 Confirm the 'height' of the site of internal opening
Sagittal section
1 Extent of fistula tract in posterior fistulas- Relation with sacrococcygeal spine, presacral space
2 Extent of fistula tract in anterior fistulas- Relation with urethra

format (Table 1) (Figure 1). This parameter (HOPE) conveys the amount of EAS involved by the fistula tract (Figure 1).

The study concept was reviewed and approved by the Hospital-Institute Ethics Committee.

CONCLUSION

This paper describes two novel additions to the MRI reporting of anal fistulas. The first is inclusion of a video along with the standardized written report (Tables 1 and 2, Video 1). This would prevent loss of vital three-dimensional data about the disease when the information is being transferred from the radiologist to the operating surgeon and would significantly enhance the surgeon's understanding of the fistula anatomy. Second, when the HOPE parameter (height of penetration of external anal sphincter by the fistula) is incorporated in the video as well as written report, the risk of EAS damage would be drastically reduced and the success rate of the surgical procedure would also be enhanced. Therefore,

HOPE should be reported as a separate parameter apart from the location of the internal opening. This format of MRI reporting (including a video) can also be stored on PACS (picture archiving and communication system)[9,10]. PACS provide storage and convenient access to medical images from where the clinician can see the report, images as well as the video as per their convenience[9,10].

FOOTNOTES

Author contributions: Garg P conceived and designed the study, collected, and analyzed the data, revised the data, finally approved and submitted the manuscript (Guarantor of the review); Kaur B and Yagnik VD collected, and analyzed the data, revised the data, finally approved and submitted the manuscript; Dawka S critically analyzed the data, reviewed and edited the manuscript, finally approved and submitted the manuscript

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