EVALUATION OF COMPLEX ANAL FISTULA CHARACTERISTICS ON MAGNETIC RESONANCE IMAGING ACCORDING TO THE GARG CLASSIFICATION

ĐÁNH GIÁ ĐẶC ĐIỂM RÒ HẬU MÔN PHỨC TẠP TRÊN CỘNG HƯỞNG TỪ THEO PHÂN LOẠI GARG

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Abstract - Complex anal fistula, according to Garg classification, which is considered more accurate than previous classifications, but has not been widely applied. We conducted this study to evaluate magnetic resonance imaging findings of complex anal fistula based on Garg classification and compare with previously used classifications. Descriptive cross-sectional study, including 57 patients diagnosed with complex anal fistula, according to Garg classification based on magnetic resonance imaging results at Hue Central Hospital, from March 2023 to January 2025. Complex anal fistula according to Garg classification included 28.1% grade III, 66.7% grade IV and 5.3% grade V. There were 61 primary fistulas detected in 57 patients. Cases with secondary fistulas was 31.6% and with associated abscesses was 59.7%. There were 3 cases of intersphincteric fistulas according to Parks classification corresponding to Garg classification grade IV. The Garg classification of complex anal fistula provides additional information than previous classifications.

Key words - Anal fistula; complex anal fistula; magnetic resonance imaging; Garg classification.

Tóm tắt - Rò hậu môn phức tạp theo phân loại Garg được đánh giá là chính xác hơn so với các phân loại trước đây, tuy nhiên vẫn chưa được áp dụng rộng rãi. Chúng tôi thực hiện nghiên cứu này để đánh giá rò hậu môn phức tạp theo phân loại Garg và đối chiếu với các phân loại trước đây. Đây là nghiên cứu mô tả cắt ngang, 57 bệnh nhân được chẩn đoán rò hậu môn phức tạp theo phân loại Garg dựa trên kết quả cộng hưởng từ tại Bệnh viện Trung ương Huế, từ tháng 3 năm 2023 đến tháng 01 năm 2025. Rò phức tạp theo phân loại Garg gồm có 28,1% độ III, 66,7% độ IV và 5,3% độ V. Có 61 đường rò nguyên phát ở 57 bệnh nhân. Có 31,6% trường hợp có đường rò phụ và 59,7% trường hợp có ổ áp xe kèm theo. Có 3 trường hợp rò gian cơ thắt ở phân loại Parks tương ứng rò độ IV theo Garg. Phân loại rò hậu môn phức tạp theo Garg giúp bổ sung các thông tin cần thiết hơn so với các phân loại trước đây.

Từ khóa - Rò hậu môn; rò hậu môn phức tạp; cộng hưởng từ; phân loại Garg.

1. Introduction

Anal fistula is defined as an epithelialized tract connecting the perianal skin to the anal canal [1]. Among these, complex fistulas are considered difficult to treat, with a high recurrence rate and a risk of postoperative fecal incontinence [2]. Currently, preoperative imaging techniques play a crucial role in the diagnosis and classification of anal fistulas. Various modalities are available, including fistulography, computed tomography, endoanal ultrasonography, and magnetic resonance imaging (MRI) [3]. MRI, with its superior soft tissue contrast and multiplanar reconstruction capabilities, has become the preferred method for evaluating anal fistulas [4]. The application of MRI in the classification of anal fistulas aims to guide and predict surgical outcomes. Anal fistulas are commonly classified into simple and complex types. Simple fistulas are considered cases that can be treated by fistulotomy without risk of fecal incontinence. Complex fistulas require sphincter-preserving surgical techniques [5].

The first classification of anal fistulas was described by Parks et al. in 1976 [6]. The authors analyzed 400 cases of anal fistulas treated over 15 years and classified them into four types based on the relationship between the fistula tract and the anal sphincter. This classification was widely used before the advent of MRI. In 2000, Morris et al. at St James's University Hospital introduced the first MRI-based classification of anal fistulas [7]. The SJUH (St James's University Hospital) classification consists of five grades, increasing in complexity. Grades I–II are considered simple fistulas, while grades III–V are complex fistulas. Since then, MRI has become widely accepted as an imaging modality for the diagnosis of anal fistulas. With its high soft tissue resolution, MRI accurately assesses the presence of primary tracts, secondary tracts, associated abscesses, and their relationship with the anal sphincter [8]. These are critical factors for surgical planning.

In 2005, the American Society of Colon and Rectal Surgeons introduced the SPTF (Standard Practice Task Force) classification, dividing anal fistulas into simple and complex types [9]. According to this classification, surgery for complex fistulas carries a high risk of fecal incontinence. For simple fistulas, fistulotomy can be safely performed [1]. Recently, Garg P et al. [10] proposed a new five-grade classification based on a study of 440 patients with anal fistulas. This classification was first introduced in 2017 and validated in 2020 in a study of 848 patients, based on the combination of MRI findings and

intraoperative observations [10, 11]. The Garg classification is considered more accurate than previous classifications but has not been widely adopted. Therefore, we conducted this study to evaluate complex anal fistulas on MRI according to the Garg classification, and to compare them with previously used classifications.

2. Materials and methods

2.1. Study subjects

A prospective, cross-sectional descriptive study was conducted, including 57 patients diagnosed with complex anal fistulas based on MRI findings at Hue Central Hospital, from March 2023 to January 2025. The study was approved by the Ethics Committee of Hue University of Medicine and Pharmacy, Hue University.

Inclusion criteria: patients aged ≥18 years, presenting with clinical symptoms suggestive of anal fistula and who underwent MRI, with complex anal fistula classified according to Garg [11]. Exclusion criteria: patients with fistulas due to Crohn's disease, post-radiation, malignancy, rectovaginal fistulas in women, or poor-quality MRI images.

2.2. MRI technique

Patients were positioned supine and scanned using a 1.5 Tesla MRI scanner (Siemens, Germany) with a surface coil. No bowel preparation or rectal contrast administration was required. After identification of the anal canal in three planes, oblique coronal images parallel to the anal canal axis and oblique axial images perpendicular to the anal canal axis were obtained. The following pulse sequences were performed: T1W TSE, T2W TSE, STIR, and contrast-enhanced T1W fatsat. The field of view (FOV) included the planes above the levator ani muscle.

2.3. MRI features

Table 1. *Classification of anal fistulas according to Garg [11]*

Grade	Characteristics	Classification
Grade I	Low intersphincteric or low transsphincteric fistula	Simple fistula
Grade II	Low intersphincteric or low transsphincteric fistula with extensions	
Grade III	IIIA. High intersphincteric or high transsphincteric fistula IIIB. Fistulas associated with Crohn's disease, sphincter injury, post – radiation, or anterior fistulas in women	Complex fistula
Grade IV	High transsphincteric fistula with extensions	
Grade V	VA. High transsphincteric fistula with suprasphincteric extensions VB. Suprasphincteric fistula; VC. Extrasphincteric fistula	
Extension: Secondary tract, abscess, horseshoe fistula.		

MRI parameters collected included: primary tract, internal opening, external opening, secondary tract, and associated abscess. The internal opening (the starting point of the fistula) is defined as the site where the tract enters the lumen of the anal canal, identified on MRI as the location of the tract in the intersphincteric space closest to the anal canal. The external opening is the site where the tract opens onto the perianal skin or perineum. If the primary tract ends in the subcutaneous fat, it is termed a sinus tract. An abscess is defined as a collection with similar signal characteristics to the tract but with a diameter >10 mm and marked peripheral enhancement, according to the criteria of Singh [12] and Torkzad [13].

Anal fistula classifications: Garg classification, Parks classification, SJUH classification, and SPTF classification.

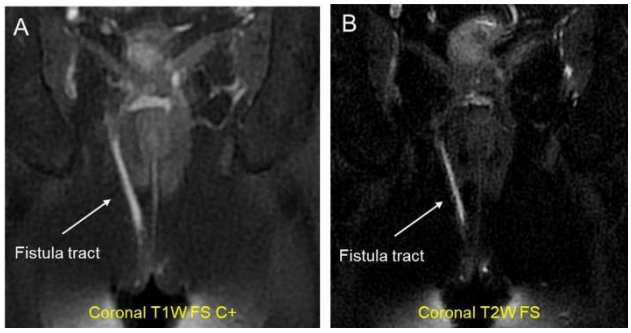

Figure 1. *Grade III anal fistula according to Garg classification*

(A) Post-contrast fat-suppressed T1W sequence and (B) fat-suppressed T2W sequence in the coronal plane show a high transsphincteric fistula tract. In this case, the tract is high transsphincteric without extension.

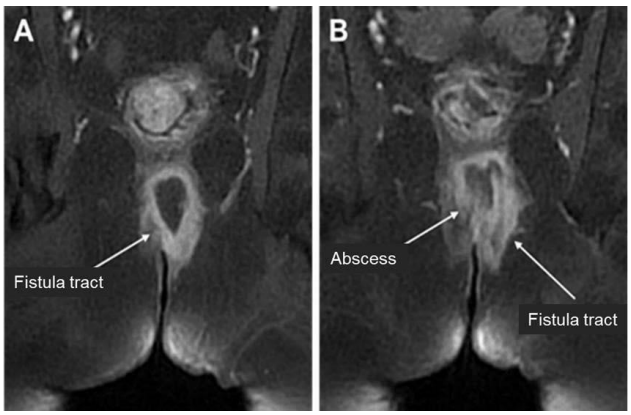

Figure 2. *Grade IV anal fistula according to Garg classification*

Post-contrast fat-suppressed T1W sequence in the coronal plane shows an abscess in the intersphincteric space (A) and a high transsphincteric tract communicating with the abscess (B).

Figure 3. *Grade V anal fistula according to Garg Classification*

Post-contrast fat-suppressed T1W sequence, (A) sagittal plane shows a high transsphincteric tract communicating with an abscess. (B) Coronal plane shows an abscess in the supralevator space.

- Parks classification [6]: includes intersphincteric,

transsphincteric, suprasphincteric, and extrasphincteric fistulas.

- SJUH classification [7]: divides anal fistulas into five grades:

• Grade I: Simple intersphincteric fistula;

• Grade II: Intersphincteric fistula with abscess/ secondary tract;

• Grade III: Transsphincteric fistula;

• Grade IV: Transsphincteric fistula with abscess/ secondary tract;

• Grade V: Supralevator fistula.

- SPTF classification [9]: Developed by the American Society of Colon and Rectal Surgeons, the SPTF classification divides anal fistulas into simple and complex types.

2.4. Statistical analysis

Statistical analysis was performed using SPSS version 25.0. Continuous variables are presented as mean ± standard deviation ($\bar{x}$ ± s) or median, and categorical variables are presented as percentages (%).

3. Results

The study included 57 patients with complex anal fistulas according to the Garg classification. Of these, 91.2% were male and 8.8% were female, with a mean age of 42.1 ± 11.2 years (range: 19–70 years). The mean BMI was 23.3 ± 3.5 (range: 16.5–33.6) kg/m². The recurrence rate of anal fistula was 36.9%. Among the patients, 86.0% reported anal pain, 86.0% had discharge in the perianal region, and 42.1% presented with perianal swelling.

Table 2. *General characteristics*

Characteristics		Results	
Gender (n, %)	Male	52	91.2 %
	Female	5	8.8 %
Age (years)		42.1 ± 11.2 (19 – 70)	
BMI (kg/m^2)		23.3 ± 3.5 (16.5 – 33.6)	
Recurrent anal fistula (n, %)	1st	16	28.1 %
	2nd	4	7.0 %
	≥ 3rd	1	1.8 %
Symptoms (n, %)	Anal pain	49	86.0 %
	Anal swelling	24	42.1 %
	Discharge	49	86.0 %

Complex fistula characteristics on MRI according to the Garg classification are described in Table 3: 28.1% were grade III, 66.7% were grade IV, and 5.3% were grade V. Regarding the primary tract, 61 primary tracts were detected in 57 patients. There was one internal opening in 93.0% of cases and two internal openings in 7.0%. Sinus tracts (without external opening) accounted for 28.1%; 63.2% had one external opening and 8.8% had two external openings. Secondary tracts were present in 31.6% of cases, and associated abscesses in 59.7%.

Comparison of complex anal fistulas on MRI according to Garg classification with other classifications is shown in Table 4. There were three cases of intersphincteric fistulas according to Parks classification corresponding to Garg grade IV. Three cases of simple grade II fistulas according to SJUH were classified as complex grade IV according to Garg. All cases were classified as complex fistulas according to SPTF.

Table 3. *Characteristics of complex fistulas on MRI*

Characteristics		N	%
Complex fistulas (Garg classification)	Grade III	16	28.1 %
	Grade IV	38	66.7 %
	Grade V	3	5.3 %
Primary tract	Single tract	53	93.0 %
	Two tracts	4	7.0 %
Internal openings (n, %)	One internal opening	53	93.0 %
	Two internal openings	4	7.0 %
External openings (n, %)	None	16	28.1 %
	One external opening	36	63.2 %
	Two external openings	5	8,8 %
Secondary tract (n, %)	None	39	68,4 %
	One secondary tract	15	26,3 %
	Two secondary tracts	3	5,3 %
Associated abscess (n, %)	None	23	40,4 %
	One abscess	29	50,9 %
	Two abscesses	5	8,8 %

Table 4. *Comparison of Garg classification of complex fistulas with other classifications*

Anal fistula classification		Garg Classification			Total
		Grade III	Grade IV	Grade V	
Parks classification	Intersphincteric fistula	0	3	0	3
	Transsphincteric fistula	16	35	0	51
	Suprasphincteric fistula	0	0	3	3
	Extrasphincteric fistula	0	0	0	0
St James classification	Grade I	0	0	0	0
	Grade II	0	3	0	3
	Grade III	16	0	0	16
	Grade IV	0	35	0	35
	Grade V	0	0	3	3
SPTF classification	Simple fistula	0	0	0	0
	Complex fistula	16	38	3	57

4. Discussion

Anal fistula is a common disease in young and middle-aged men, with a male-to-female ratio of 2:1. The annual incidence is approximately 10 per 100,000 people and accounts for 25% of anorectal diseases, ranking second after hemorrhoids [14]. The etiology of anal fistula is diverse, including tuberculosis, Crohn's disease, pelvic infections, malignancy, trauma, diverticulitis, and radiation [15]. However, most cases are considered idiopathic, based on the cryptoglandular hypothesis. Obstruction of the anal gland ducts can lead to infection in the intersphincteric space, with subsequent extension through the internal or external sphincter into the

ischiorectal fossa [16]. Our study included 57 patients with complex anal fistulas according to the Garg classification, with 61 primary tracts. The male-to-female ratio was 10:1, with 52 males and 5 females. The mean age was 42.1 ± 11.2 years (range: 19–70).

Many studies have reported the important role of MRI in identifying the primary tract, internal opening, external opening, secondary tract, abscess, and classifying anal fistulas [4, 5, 17]. Most cases have a single primary tract, but some patients may have multiple tracts. Our results showed that 93.0% had one primary tract and 7.0% had two primary tracts. Vo D [18] reported that 90.7% of cases had one primary tract, with a maximum of four primary tracts in one case. Zhao W et al. [4] found that 36.5% of patients had two or more tracts. On MRI, the internal opening is usually identified as the site of the tract in the intersphincteric space closest to the anal canal [12, 18]. In our study, 93% had one internal opening and 7% had two internal openings. Multiple internal openings may be due to multiple primary tracts or secondary tract opening into the anal canal. Our study found that all cases with two internal openings were due to multiple primary tracts. Furthermore, 31.6% of cases had secondary tract, but none of these opened into the anal canal to form additional internal openings.

The primary tract is termed a sinus tract when it ends in the subcutaneous fat and lacks an external opening. Zhao W [4] reported that sinus tracts accounted for 29.6% of anal fistula cases, while our study found a rate of 28.1%. Any fluid collection or tract extension with a diameter >10 mm is considered an abscess [12, 13]. According to this definition, our study found that 34 cases (59.7%) had associated abscesses, with 8.8% having two abscesses. Previous studies have demonstrated that if surgeons are informed of secondary tract and associated abscesses on preoperative MRI, the recurrence rate of anal fistula can be reduced [19, 20].

The Parks classification is considered the first anal fistula classification [10]. In a study of 440 cases, the two most common types were intersphincteric (38.6%) and transsphincteric (52.9%). Suprasphincteric fistulas were less common (5.4%), and no extrasphincteric fistulas were recorded [10]. Our study also showed that transsphincteric fistulas were the most common (89.4%). The limitation of the Parks classification is the lack of description of tract extensions, such as secondary tract, associated abscesses, and horseshoe fistulas. Among 51 transsphincteric cases in our study, 35 cases (68.6%) had associated extensions, classified as grade IV according to Garg. In this study, only complex cases according to Garg were included, so low intersphincteric fistulas were excluded, and three high intersphincteric cases were selected (5.2%). Additionally, 5.2% were suprasphincteric (Parks III), and no extrasphincteric cases (Parks IV) were found. Other studies have also reported no extrasphincteric cases [7, 10]. Extrasphincteric fistulas are considered extremely rare, and some authors suggest that they should not be classified as a separate grade [11]. The Garg classification includes extrasphincteric fistulas as grade VC, and also adds grade VA (high transsphincteric fistula with supralevator extension) and VB (supralevator fistula) to grade V. In our study, complex grade V fistulas according to Garg accounted for 3 cases (5.3%).

The SJUH classification is an improvement over the Parks classification [7]. It consists of five grades based on MRI findings and helps predict surgical outcomes. Grades I–II are simple fistulas with a good prognosis after surgery, while grades III–V are complex fistulas with a risk of recurrence or fecal incontinence after surgery. In our study, grade III and V fistulas according to Garg corresponded completely to grade III and V according to SJUH. Among 38 grade IV cases according to Garg, 35 corresponded to grade IV according to SJUH, and three did not (grade II according to SJUH). These results show a high degree of concordance between the two classifications in evaluating complex anal fistulas on MRI. However, our study excluded cases with specific diseases, which are classified as grade IIIB according to Garg.

The Garg classification was introduced to stratify the complexity of anal fistulas and guide the selection of appropriate surgical techniques [5]. Grades I–II according to Garg are simple fistulas and can be safely treated with fistulotomy. Grades III–V are complex fistulas requiring sphincter-preserving techniques. Some studies have shown that previous classifications, such as Parks and SJUH, do not always correspond to surgical indications [11]. For example, a low transsphincteric fistula with a small abscess would be classified as complex by Parks (grade II) and SJUH (grade IV), but as simple by Garg (grade II). These fistulas can be easily treated by fistulotomy [11]. In our study, three cases of high intersphincteric fistulas with extensions were classified as complex by Garg (grade IV), while these cases were classified as simple by Parks (grade I) and SJUH (grade II). In all three cases, we did not indicate fistulotomy.

The SPTF classification divides anal fistulas into simple and complex types [9]. Simple fistulas can be treated by fistulotomy without risk of fecal incontinence. Complex fistulas, if treated by fistulotomy, carry a high risk of fecal incontinence [5]. In our study, all complex fistulas on MRI according to Garg were also classified as complex by SPTF. Therefore, the Garg classification may help guide surgical management of anal fistulas.

In summary, MRI is a valuable imaging modality that can accurately and comprehensively assess the characteristics of anal fistulas, including internal opening, external opening, secondary tract, and associated abscesses. MRI provides high soft tissue resolution, allowing evaluation of the relationship between the primary tract and the anal sphincter. This enables precise classification of anal fistulas and guides appropriate surgical management. The commonly used MRI-based classifications are Parks, SJUH, SPTF, and Garg. Among these, the Garg classification of complex anal fistulas provides more information than previous classifications.

Our study has some limitations. First, it was conducted at a single center with a small sample size. Second, we did

not compare findings with surgical outcomes, so the prognostic value of the Garg classification could not be confirmed. However, our results clarify the characteristics of complex fistulas according to the Garg classification based on MRI, and compare them with the Parks, SJUH, and SPTF classifications.

5. Conclusion

Magnetic resonance imaging provides comprehensive information on the characteristics of anal fistulas, enabling accurate classification of complex anal fistulas. The Garg classification of complex anal fistulas supplements previous classifications by providing more essential information.

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