



:  
 : 1998 1 1999 3 가 가  
 17 .  
 : 17  
 76%(13 ) , 94%(16 ) .  
 ,  
 92%(12 11 ) , 33%(3 1 ) , 50%(2 1 ) ,  
 100%(12 12 ) , 67%(3 2 ) , 100%(2 2 ) .  
 . kappa ( = 0.820 ) , ( = 0.866 )  
 :

, 1998 1 1999 3 가 23  
 , 1% gentian violet methylene 17  
 blue (1, 2).  
 (Endoanal ultrasonography) (EU M3, Olympus, Tokyo, Japan) .  
 (Endorectal magnetic resonance imaging) (H<sub>2</sub>O<sub>2</sub>) ,  
 (3 - 6). 360 °  
 가 11 cm 4 cm  
 (Medrad, Pittsburgh, U.S.A.)  
 T1  
 (TR/RE = 600/20 msec) T2 (TR/TE = 4000/98 msec) 14 cm (field of view), 3 mm (slice thickness), , 256 × 256 (matrix number)  
 1  
 2  
 2000 3 28 2000 9 6 .

가  
Dotarem(Guerbet, Paris, France) 1 mmol/kg  
1 7  
10  
1  
Parks  
(Intersphincteric type),  
(Transsphincteric type),  
(Extrasphincteric type)  
5가  
Parks (7)  
(Suprasphincteric type),  
(Horse - shoe type)  
(Fig. 1).  
kappa

2 (13%)  
(Table 1).

13 2

**Table 1.** The Data in Patients with Anorectal Fistula according to EMRI, EUSG and Operation

| Patient number | Age | Sex  | EUSG  | EMRI  | Operation |
|----------------|-----|------|-------|-------|-----------|
| 1              | 44  | Male | Trans | Trans | Supra     |
| 2              | 68  | Male | Trans | Trans | Trans     |
| 3              | 61  | Male | Extra | Trans | Trans     |
| 4              | 54  | Male | Supra | Supra | Supra     |
| 5              | 61  | Male | Trans | Trans | Trans     |
| 6              | 66  | Male | Extra | Extra | Extra     |
| 7              | 72  | Male | Extra | Supra | Supra     |
| 8              | 70  | Male | Trans | Extra | Extra     |
| 9              | 57  | Male | Trans | Trans | Trans     |
| 10             | 68  | Male | Trans | Trans | Trans     |
| 11             | 51  | Male | Trans | Trans | Trans     |
| 12             | 67  | Male | Trans | Trans | Trans     |
| 13             | 67  | Male | Trans | Trans | Trans     |
| 14             | 65  | Male | Trans | Trans | Trans     |
| 15             | 66  | Male | Trans | Trans | Trans     |
| 16             | 50  | Male | Trans | Trans | Trans     |
| 17             | 45  | Male | Trans | Trans | Trans     |

EMRI : endorectal magnetic resonance imaging

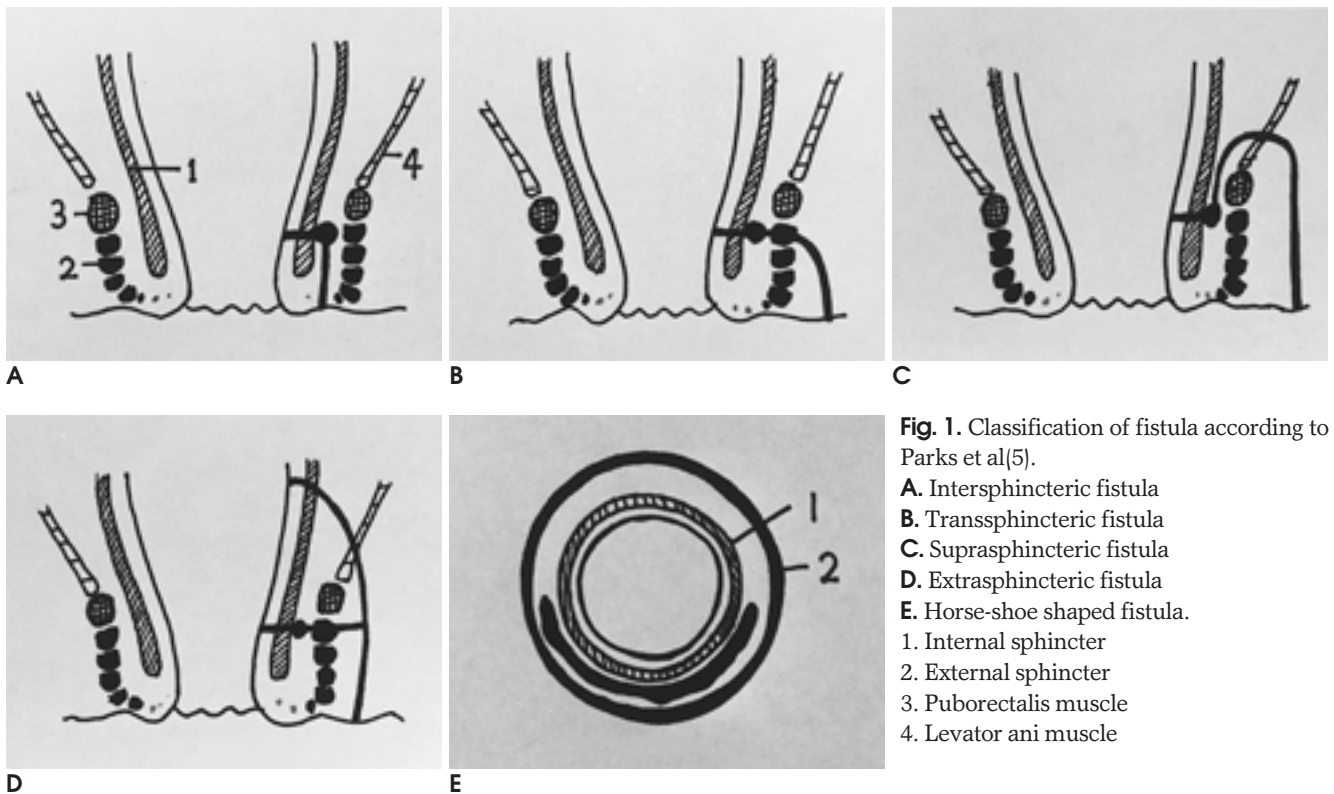
EUSG : endoanal ultrasonography

Trans : Transsphincteric fistula

Supra : Suprasphincteric fistula

Extra : Extrasphincteric fistula

12 (69%), 3 (19%)



**Fig. 1.** Classification of fistula according to Parks et al(5).

- A. Intersphincteric fistula
- B. Transsphincteric fistula
- C. Suprasphincteric fistula
- D. Extrasphincteric fistula
- E. Horse-shoe shaped fistula.
- 1. Internal sphincter
- 2. External sphincter
- 3. Puborectalis muscle
- 4. Levator ani muscle

3 2  
(Table 2).  
13 1  
(Table 3).  
76%(17 13 )  
94%(17 16 )  
(Fig. 2), (Fig. 3) (Fig. 4) 16  
92%(12 11 )  
, 33%(3 1 ) 50%(2 1 )  
100%(12 12 ), 67%(3 2 )  
100%(2 2 )  
13 ( =0.820,  
( =0.866,)

**Table 2.** The Prevalence of Morphologic Types of Fistula in EUSG

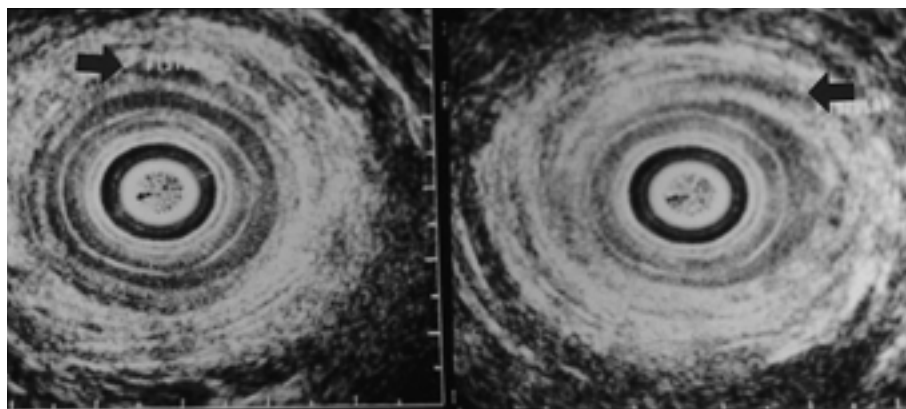
| Operation | No. | EUSG  |       |       | Concordance (%) |
|-----------|-----|-------|-------|-------|-----------------|
|           |     | Trans | Supra | Extra |                 |
| Trans     | 12  | 11    | 0     | 1     | 92              |
| Supra     | 3   | 1     | 1     | 1     | 33              |
| Extra     | 2   | 1     | 0     | 1     | 50              |
| Total     | 17  | 13    | 1     | 3     |                 |

EUSG : endoanal ultrasonography  
No. : Number of patient  
Trans : Transsphincteric fistula  
Supra : Suprasphincteric fistula  
Extra : Extrasphincteric fistula

**Table 3.** The Prevalence of Morphologic Types of Fistula on EMRI

| Operation | No. | EMRI  |       |       | Concordance (%) |
|-----------|-----|-------|-------|-------|-----------------|
|           |     | Trans | Supra | Extra |                 |
| Trans     | 12  | 12    | 0     | 0     | 100             |
| Supra     | 3   | 1     | 2     | 0     | 67              |
| Extra     | 2   | 0     | 0     | 2     | 100             |
| Total     | 17  | 13    | 2     | 2     |                 |

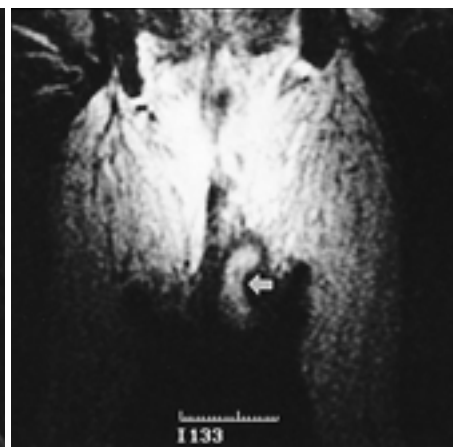
EMRI : endorectal magnetic resonance imaging  
No. : Number of patient  
Trans : Transsphincteric fistula  
Supra : Suprasphincteric fistula  
Extra : Extrasphincteric fistula



A

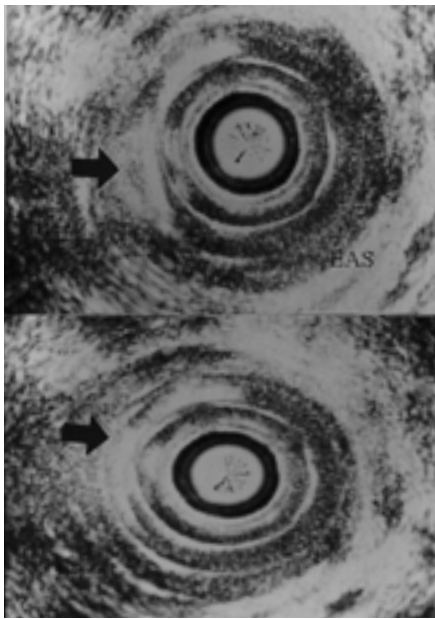


B

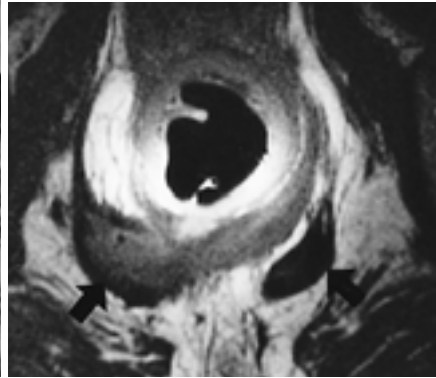


C

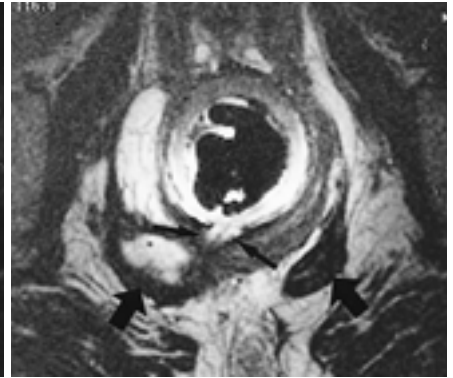
**Fig. 2.** Transsphincteric type ; EUSG(A) shows low echoic fistulous track(arrow) which is located outside of external anal sphincter. Axial(B) and coronal(C) T2WI shows high signal intensity fistulous tract(arrow) from rectal wall through intersphincteric space around 1 O'clock area, which extends to external anal sphincter(C)



A



B



C



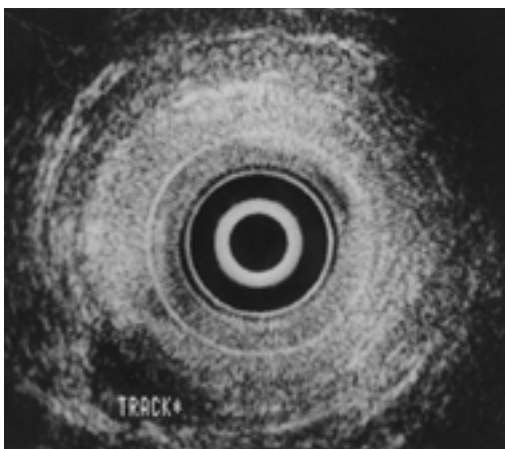
D



E

**Fig. 3.** Suprasphincteric type; EUSG(A) shows small fistulous track(large arrow) passing upward in the intersphincteric plane inside the external anal sphincter (EAS).

The large and long fistulous tracts(large arrows) with one common internal opening(small arrows in C and E) at midline of posterior portion of rectum, which drains into 5 and 7 O'clock external opening sites. These show low signal intensity on T1WI(B) and high signal intensity on axial and coronal T2WI(C, D) and contrast enhancement on gadolinium enhanced axial T1WI(E).



A



B



C

**Fig. 4.** Extrasphincteric type ; EUSG(A) shows well defined low echogenic fistula(asterisk) around 7 O'clock area which is located outside of external anal sphincter.

Axial(B) and sagittal(C) T2WI shows high signal intensity fistulous tract(arrows) in off the midline to the right on posterior portion of rectum.

가 68% 96%

(anal gland)  
 (anal crypt)  
 (inter -  
 nal opening)  
 (external opening)  
 (3, 4).  
 (5).

가 가  
 1

가

가

. Law (8)

7MHz

가

(Levator ani muscle)

Law (8) 가

T2

(9).

T2

가

T2

(10, 11)

가

(71%) 가

Hussian (3)

가 36% 64%

. Stoker

(12) Nandita (13)

MRI

(signal to noise ratio)

(body surface coil)

(phased array

coil)

Halligan (14)

1. 1993;9:255-260
2. 1993;9:381-383
3. Hussian SM, Stoker J, Schouten WR, Hop WCJ, Lameris JS. Fistula in ano : Endoanal sonography versus endoanal MR imaging in classification. *Radiology* 1996;200:475-481
4. MRI 1997;36:657-660
5. Myhr GE, Myrvold HE, Nilsen G, Thoresen JE, Rinck PA. Perianal fistulae: use of MR imaging for diagnosis. *Radiology* 1994;191:545-549
6. Lunniss PJ, Armstrong P, Barker PG, Reznick RH, Phillips RK. Magnetic resonance imaging of anal fistulae. *Lancet* 1992;340:394-396
7. Parks AG, Golden PH, Hardcastle JD. A classification of fistula in ano. *Br J Surg* 1976;63:1-12
8. Law PJ, Talbot RW, Artram CI, et al. Anal endosonography in the evaluation of perianal sepsis and fistula in ano. *Br J Surg* 1989;157:503-508
9. Barker PG, Lunis PJ, Armstrong P, Reznick RH, Cottam K, Phillips RK. Magnetic resonance imaging of fistula-in-ano: technique, interpretation and accuracy. *Clin Radiol* 1994;49:7-13
10. Desouza NM, Puni R, Kmiot WA, Bartram CI, Hall AS, Bydder GM. MRI of the anal sphincter. *J Comput Assist Tomogr* 1995;19:745-751
11. Hussian SM, Stoker J, Lameris JS. Anal sphinctric complex: Endoanal MR imaging of normal anatomy. *Radiology* 1995;197:671-677
12. Stoker J, Hussian SM, Van Kempen D, Eleveit AJ, Lameris JS. Endorectal coil in MR imaging of anal fistula. *AJR Am J Roentgenol* 1996;166:360-362
13. Desouza NM, Gilderdale DJ, Coutts GA, Puni R, Steiner RE. MRI of fistula-in-ano: a comparison of endoanal coil with external phased array coil technique. *J Comput Assist Tomogr* 1998;22(3):357-363
14. Halligan S, Bartram CI. MR imaging of fistula in ano: Are endoanal coils the gold standards?. *AJR Am J Roentgenol* 1998;171:407-412

## The Diagnostic Concordance of Endoanal Ultrasonography and Endoanal MRI in Cases of Anorectal Fistula<sup>1</sup>

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**Purpose:** To evaluate the preoperative diagnostic concordance of morphologic classification of anorectal fistula by endoanal ultrasonography (EUSG) and endoanal magnetic resonance imaging (EMRI).

**Materials and Methods:** Between January 1998 and March 1999, 17 patients with anorectal fistula underwent endoanal ultrasonography and magnetic resonance imaging for preoperative assessment. The types of fistula and abscess formation were evaluated, and the findings compared with those obtained during surgery.

**Results:** The overall accordance of anorectal fistula was 76% (13 of 17 cases) on ultrasonography and 94% (16 of 17 cases) on magnetic resonance imaging. According to the findings of EUSG, the accordance of each type of anorectal fistula was as follows: transphincteric, 92% (11 of 12 cases); suprasphincteric, 33% (1 of 3); and extrasphincteric, 50% (1 of 2), while for EMRI, the respective figures were 100% (12 of 12 cases), 67% (2 of 3), and 100% (2 of 2). An analysis of reproducibility using kappa value showed that overall concordance between endoanal ultrasonography and surgery ( $\kappa = 0.820$ ) as well as between endoanal MRI and surgery ( $\kappa = 0.866$ ), was very close.

**Conclusion:** For the evaluation of anorectal fistula, preoperative endoanal magnetic resonance imaging was more accurate and informative than endoanal ultrasonography.

**Index words :** Fistula, gastrointestinal tract

Magnetic Resonance (MR), comparative studies

Ultrasound(US), comparative studies

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