



Original article

Endoanal ultrasound findings in patients with faecal incontinence using a scoring system

Sílvia Salvans,^a David Parés^{a,*} Miguel Pera,^a Marta Pascual,^a Sandra Alonso,^a Ricard Courtier,^a Maria José Gil,^a Yolanda Maestre,^a Inés Ibañez-Zafón,^b Silvia Delgado-Aros,^b and Luis Grande^a

^aUnidad de Cirugía Colorrectal, Servicio de Cirugía General y Digestiva, Hospital Universitari del Mar, Barcelona, Spain

^bUnidad de Motilidad Digestiva, Servicio de Gastroenterología, Hospital Universitari del Mar, Barcelona, Spain

ARTICLE INFO

Article history:

Received April 15, 2009

Accepted May 16, 2009

Online August 19, 2009

Keywords:

Faecal incontinence

Endoanal ultrasound

Starck score

Anal sphincter injury

A B S T R A C T

Introduction: The main aim of the study was to apply a severity classification of sphincter lesions detected by endoanal ultrasound using Starck score in patients who suffered faecal incontinence.

Material and method: Data were analysed on 133 patients with faecal incontinence. Those in whom anal sphincter lesions were detected by endoanal ultrasound are described and their corresponding scores according to Starck classification calculated. This system scores severity of detected sphincter lesions from 0 to 16, involving the three axes of the anal canal. Patient demographic characteristics and anorectal manometry results were also analysed. The relationship between this score, patient gender and age, and anorectal manometric results were also analysed.

Results: A total of 83 (62.4%) patients had some type of anal sphincter lesion. The presence of sphincter defects was not related to gender ($P=.172$), although it did correlate with younger ages ($P=.028$). The severity of anal sphincter damage by Starck score did not show significant correlation to gender ($P=.327$) or to the age ($P=.350$) of patients. However, a significant correlation was detected between Starck score and anal resting pressure ($P=.008$) or anorectal squeeze pressure ($P=.011$).

Conclusions: The presence of anal sphincter injuries could be well defined by Starck score in patients with faecal incontinence. Severity of damage scored by Starck correlated with anorectal manometric results.

© 2009 AEC. Published by Elsevier España, S.L. All rights reserved.

Presented at the 6th Catalan Surgical Congress (Barcelona, October 18–19, 2007), 12th National Meeting of the Spanish Coloproctology Association (Valencia, May 14–16, 2008) and 27th National Surgical Congress (Madrid, November 3–6, 2008).

*Corresponding author.

E-mail address: dpares@imas.imim.es (D. Parés).

0009-739X/\$ - see front matter © 2009 AEC. Published by Elsevier España, S.L. All rights reserved.

Descripción de los hallazgos de la ecografía endoanal en pacientes con incontinencia fecal mediante un sistema de puntuación

R E S U M E N

Palabras clave:

Incontinencia fecal
Ecografía endoanal
Puntuación de Starck
Lesión esfinteriana anal

Introducción: El objetivo principal del estudio fue la aplicación de una clasificación de gravedad de las lesiones esfinterianas halladas en ecografías endoanales mediante el sistema de puntuación de Starck en pacientes con incontinencia fecal (IF).

Material y métodos: Se analizaron los datos de 133 enfermos con IF, en los que se describió la presencia ecográfica de lesiones esfinterianas, y su puntuación según el sistema de Starck. Este sistema asigna un valor entre 0 y 16 puntos a la lesión detectada según su gravedad en los 3 ejes del espacio del canal anal. Se estudió también la relación entre la gravedad de estas lesiones, el sexo, la edad de los pacientes y los hallazgos de la manometría anorrectal. **Resultados:** Ochenta y tres pacientes (62,4%) presentaron algún tipo de lesión esfinteriana. Estas lesiones no se asociaron de manera significativa al sexo de los pacientes ($p=0,172$), aunque sí se presentaron en edades más tempranas ($p=0,028$). La gravedad de las lesiones según Starck no se correlacionó con el sexo ($p=0,327$) ni con la edad ($p=0,350$) de los pacientes. Los pacientes con lesiones ecográficas más graves presentaron una menor presión anal baseline ($p=0,008$) y de contracción voluntaria ($p=0,011$) en la manometría anorrectal.

Conclusiones: La presencia ecográfica de lesiones en el complejo esfinteriano en pacientes con IF se pudo caracterizar con el sistema de puntuación de Starck. La gravedad de las lesiones se correlacionó con los valores de la manometría anorrectal.

© 2009 AEC. Publicado por Elsevier España, S.L. Todos los derechos reservados.

Introduction

The definition of faecal incontinence (FI)¹ is to go from being continent to having recurrent and involuntary loss of faecal material or flatulences. It is a medical problem that affecting up to 2% of the general population.^{2,3} However, this figure may be higher as sufferers may not inform doctors about the disorder out of embarrassment, shame or fear. Faecal incontinence can therefore be considered as a real public health problem, and it represents a physical, psychological and social problem.⁴⁻⁷

Faecal incontinence depends on the complex relationship between the anal sphincter apparatus, rectal reservoir capacity following rectal compliance, correct neurological function and consistency of the faeces.⁸ The aetiology of the FI therefore is multifactorial and in many cases it is not possible to know each factor's specific contribution.⁸ For many years now structural lesions of the anal sphincter complex have been a known aetiology of this disorder, whether it is due to the presence of obstetric lesions in women or due to the effects of surgery in both sexes.^{4,6,8-11}

In the assessment of patients with FI an endoanal echography was carried out to detect the anatomical defects of the internal anal sphincter (IAS) or external anal sphincter (EAS) and an anorectal manometry was used to assess the potential functional alterations in the anal sphincter apparatus.⁸ The advantages offered by endoanal echography over other image tests are its availability, lower cost, good tolerance by the patient and the quality of the images obtained.¹² When carried out by experts, an endoanal echography offers close to 100% sensitivity and specificity.⁸

Until now no severity classification system existed for traumatic lesions of the IAS and EAS that distinguished

groups based on severity and which could perhaps design therapeutic algorithms depending on these lesions. The Starck et al severity scoring system for echographic lesions¹³ was described in 2003 for classifying the severity of the echographic lesions detected in the anal sphincter complex during the puerperium stage in women who had undergone primary repair of the anal sphincter complex. Its use for describing anal lesions in patients with FI of any aetiology in both sexes has only been used in a recent study.¹⁴

The aim of said study was to characterise the anal sphincter lesions detected via endoanal echography by using the Starck classification system on patients with FI. The secondary aims were to study the relationship between the severity of detected traumatic lesions and the demographic characteristics of the patients and the functional repercussions of these lesions.

Material and methods

Observational retrospective study of all the data obtained in the diagnostic assessment of 133 patients affected by FI that attended the coloproctology clinic in our hospital between October 1999 and April 2008.

The demographic characteristics of the patients were analysed, as were the findings of the endoanal echography which described the presence or absence of lesions and their severity according to the Starck scoring system, and the findings of the anorectal manometry.

Endoanal echography

A Brüel & Kjaer® (Nacrum, Denmark) echography was used and a 7MHz rotary probe with a 17 mm diameter radio-lucid

cone was used to obtain 360° circular images. According to the standard description, an IAS was thought to have a lesion when a solution of continuity was noted in the corresponding hypoechogenic ring and an EAS was thought to have a lesion upon detecting discontinuity in the hyperechogenic ring or mixed echogenicity (Figure. 1).¹⁵ A lesion's characteristics from the 3 axes of the anal canal were described: depth, which defines a partial or total lesion; length, which defines the localisation of the lesion according to how it affects the upper, middle or lower anal canal; and size, defined according to the degree of damage caused to the circumference in a circular axis.¹²

Starck echographic lesion severity scoring system

The Starck et al echographic lesion severity scoring system¹³ consists of awarding a gradual score between 0 and 3 to each one of the 3 spatial axes once the echographic lesions of the IAS and the EAS have been identified (Table 1), as was done in the case of the traditional description. The total scoring therefore oscillates between 0 (no lesion in the sphincter complex) and 16 (maximum lesion in the IAS and the EAS) according to the presence or absence of lesions in the IAS or EAS throughout the whole anal canal. Then the same group classifies the severity of the lesions into three groups depending on the scoring obtained: between 1 and 4 points defines a *light defect*; between 5 and 7 points defines a *moderate defect*; and finally, a score of 8 or above is a *serious defect*.¹⁶

Anorectal manometry

A 4-channel catheter was used, as was continual water perfusion with a radial distribution into the orifices, connected to a polygraph (PC Polygraph HR Synectics Medical) and a

data entry system (Pentium-II-Software Polygram 98 AFR, Medtronic INC., MN, USA). With the patient lying on their left side, the catheter is inserted into the rectum and is then extracted gently towards the anus. The resting anorectal pressure was recorded at 1 cm intervals until the baseline anorectal pressure was determined. The voluntary contraction anorectal pressure was determined after requesting that the patient perform a voluntary contraction of the anal sphincter complex.

Statistical analysis

The qualitative variables are expressed in absolute or proportional numbers and the quantitative variables via the median and the range, or with the average and its standard deviation. The χ^2 test was used to compare the qualitative variables and the t student test or non-parametric test (Kruskal-Wallis) was used for continual variables. To calculate the correlation between the continual variable the Spearman correlation coefficient was applied. All the data was analysed using the SPSS version 12.0 statistics package. A result with a P value inferior to .05 was considered statistically significant.

Results

The data for 133 patients with an average age of 59.3 (14) years was analysed, of which 109 were women (82%). Keeping in mind that the majority of patients showed incontinence of more than one type of faecal material, the distribution of these was as follows: 48.9% faecal incontinence to flatulence; 35.6% liquid faecal incontinence; 28.9% solid faecal incontinence; and finally 46.7% suffered from soiling.

The endoanal echography showed some type of lesion in the sphincter complex in 83 patients (62.4%). In 31 of the patients (37%) a lesion in both sphincters was observed, in 15 patients (18%) a lesion was only observed in the IAS, and in 37 patients (45%) isolated damage to the EAS was observed.

As Table 2 shows, the patients with lesions in the anal sphincter complex were younger patients ($P=.028$) with no significant statistical differences between the sexes ($P=.172$). It was noted that patients with FI and lesions of the sphincter complex presented significantly lower baseline anorectal pressure than the patients without sphincter lesions ($P=.031$). A lower anorectal pressure was observed with voluntary contraction in patients with lesions, but these differences did not reach a statistically significant level ($P=.930$).

The median severity of the sphincter lesions detected in 83 of the patients using the Starck scoring system was 5 (range, 3-16). Of these, 39 patients (47%) had light defects; 19 (23%) moderate defects; and 25 (30%) serious defects.

The Starck scores did not vary in relation to the patients' gender, with the females median at 5 (3-16) and the males at 4 (3-19) ($P=.256$). As Table 3 shows, when we divided the patients according to the severity of the lesions, no statistically significant differences were seen either between different ages ($P=.350$) or between sexes ($P=.327$) depending on



Figure 1 - Example of an anal sphincter lesion that shows a serious lesion of the external anal sphincter and the internal anal sphincter.

Table 1 – Starck severity scoring system for endoanal echography lesions¹³

Characteristics of the defect	Scoring			
	0	1	2	3
External anal sphincter				
Length of the defect in anal canal	None	Half or less	More than half	All
Depth of defect	None	Partial	Total	–
Size of the lesion of the circumference in degrees	None	≤90°	91–180°	>180°
Internal anal sphincter				
Length of the defect in the anal canal	None	Half or less	More than half	All
Depth of the defect	None	Partial	Total	–
Size of the lesion of the circumference in degrees	None	≤90°	91–180°	>180°

Table 2 – Characteristics of patients with faecal incontinence according to whether or not they presented lesions of the anal sphincter complex in the endoanal echography

	Patients with lesions in the anal sphincter complex (n=83)	Patients with no lesions (n=50)	P
Age, mean (SD), y ^a	57 (13)	63 (13)	.028 ^b
Sex, n (%)			
Male	12 (14.5)	12 (24)	.172 ^c
Female	71 (85.5)	38 (76)	
Baseline pressure, mm Hg	42 (19)	53 (25)	.031 ^b
Voluntary contraction pressure, mm Hg	110 (75)	112 (51)	.930 ^b

^aAverage (standard deviation).^bt Student test.^cχ² test.

whether the lesions were light, average or severe. However, a statistically significant reduction was seen in the values from the anorectal manometry and specifically, the baseline anorectal pressure ($P=.008$) and the voluntary contractions ($P=.011$) between the three groups.

Finally, it was seen that the Starck scoring system had statistically significant correlations with the baseline anorectal pressure (coefficient, -0.460 ; $P=.001$) (Figure 2) and voluntary contraction (coefficient, -0.370 ; $P=.01$) (Figure 3).

Discussion

More than half of patients with FI have lesions of the anal sphincter complex.^{6,17,18} These lesions are traditionally described by a simple description of their effects on the IAS, EAS or both, but in this study we have used the Starck scoring system. Its application has allowed us to describe the lesions observed by echography in keeping with their severity using a scoring system which has shown good functional correlation with anorectal manometry data.

Approximately one third of our patients studied for FI presented an intact anal sphincter complex when an endoanal echography was carried out. Similar results have been recorded before in medical literature and this allows us to confirm that the association between the anorectal function and structure, and the importance that has previously been

given to structural anomalies during etiopathogeny of FI is not constant,^{8,17,18} above all, as there is evidence from previous studies which shows that patients with obstetric lesions do not necessarily experience FI.^{8,10,11,13,16-18}

The presence of sphinctral lesions in our experience does not have statistically significant associations with a patient's gender. However, previous studies have shown that the echographic lesions of the sphinctral complex in female patients are more frequent due to sphinctral lesions suffered during childbirth.^{5,18} It must not be forgotten that prior anal surgery is an important antecedent in the aetiology of some patients, both in males and females, and that during childbirth a woman can present lesions that do not specifically originate from sphinctral trauma.^{4,9,18}

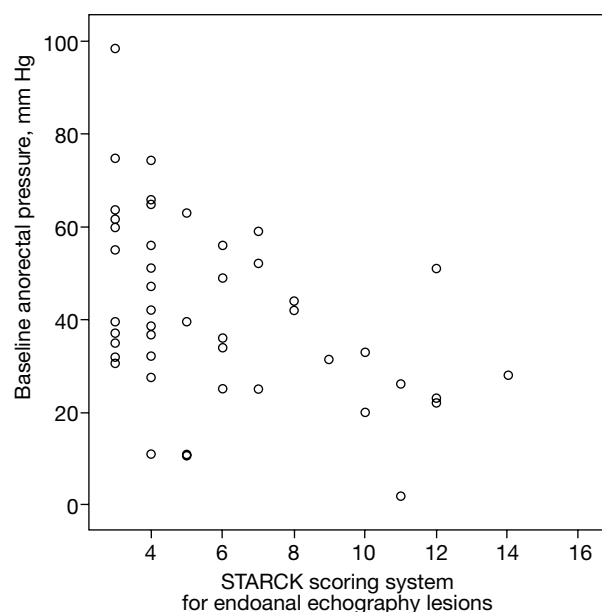
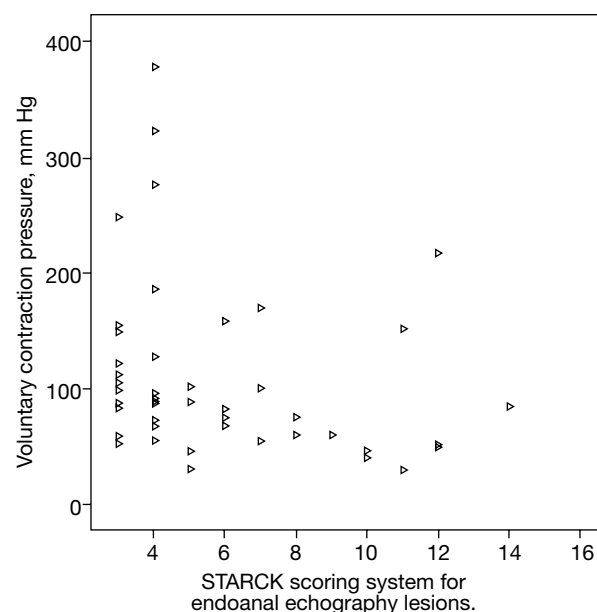
The incidence of FI is more common in the older population although it does not mean that this section of the population presents a higher incidence of lesions to the sphinctral complex; in reality, we know that there are many factors involved in FI in this group of patients.⁴⁻⁷ In our study there is a statistically significant association between patients with sphinctral lesions and younger age groups. Bordeianou et al¹⁹ also discuss this and attribute the results to a higher incidence of anorectal trauma and childbirth complications in this patient group, the latter of which is not analysed in our study.

The Starck scoring system seems to be a valid instrument as a method for categorising the severity of the lesions of the anal

Table 3 – Characteristics of patients with faecal incontinence according to the severity group using the Starck scoring system¹⁶

	Light lesions: Starck from 1 to 4 (n=39)	Moderate lesions: Starck from 5 to 7 (n=19)	Serious lesions: Starck 8 or higher (n=25)	P
Age, mean (SD), y ^a	58 (13)	59 (15)	53 (13)	.350 ^b
Sex, n (%)				
Male	8 (20.5)	2 (10.5)	2 (8)	
Female	31 (79.5)	17 (89.5)	23 (92)	.327 ^c
Baseline pressure, mm Hg	50 (19)	38 (18)	29 (13)	.008 ^b
Voluntary contraction pressure, mm Hg	135 (87)	88 (41)	79 (56)	.011 ^b

^aAverage (standard deviation).
^bt Student test.
^c χ^2 test.

**Figure 2 – Correlation between the severity of the sphincter lesions according to the Starck lesion severity scoring system¹³ and baseline anal pressure (Spearman coefficient, -0.460 ; $P=.001$)****Figure 3 – Correlation between the severity of sphincter lesions according to the Starck severity scoring system¹³ and the anorectal pressure of voluntary contraction (Spearman coefficient, -0.370 ; $P=.01$).**

sphincter complex diagnosed by endoanal ecography.¹³ In our opinion, its utility resides, above all, in the fact that it includes the same findings from the traditional description, in other words the assessment of the three spatial axes (depth, length of anal canal, and degrees of circumference affectation).^{13,20} In this way, the system can be used by clinics to assess these patients without the need to change the echographic description which has been carried out to date. As well as this, using a scoring system not only allows for the comparison of a series of patients from different centres, it is also a tool to be used in therapeutic protocols. From our point of view, its usage could avoid some ambiguous terminology such as *small* or *large lesions*, which make the patient's treatment harder, and

do not show a true classification in degrees of severity. To date, only 2 diagnosis groups have used this classification in women who have shown signs of FI during the puerperium phase.^{13,21} Recently, Dudding et al¹⁴ used this scoring system to assess all types of sphincter lesions (obstetrical and surgical) in males and females as a predictive value for response to treatment with sacral root stimulation. For the first time this study shows its correlation with anorectal manometry data in patients with FI. In our opinion, the only defect of this system of characterisation of lesions could be the joint assessment of IAS and EAS lesions, as we know that the clinical and functional consequences of the lesions in one or other of the anal sphincters tend to be different.

The relationship between a structural lesion of the anal sphincter complex and the functional repercussions measured via anorectal manometry is controversial. In our experience there is a statistically significant association with regards the fact that the most severe echographic lesions according to the Starck scoring system present lower baseline anal and voluntary contraction pressures. Voyvodic et al¹⁷ observed that there were statistically significant differences between the baseline pressure and the voluntary contraction pressure only in patients who had a severe lesion of the sphincter apparatus, or in contrary to this, in patients that did not have lesions. More recently, Bordeianou et al¹⁹ compared manometric pressures and the degrees of affectation in 2 of the 3 spatial axes (length and transverse) of both the IAS and the EAS and they arrived at the conclusion that as the degrees of affectation of the sphincter increased, the pressures decreased. It would be interesting to carry out a prospective study which included a detailed anamnesis of the type of FI of patients, with the aim of seeing whether there is a relationship between the degree of severity of the FI assessed with clinical scoring systems, the Starck echographic lesion-severity scoring system and anorectal manometry values.

In conclusion, the presence of lesions in the sphincter complex could be described with the Starck scoring system which adequately corresponds with the anorectal pressures measured using anorectal manometry.

REFERENCES

1. Wald A. Clinical practice. Fecal incontinence in adults. *N Engl J Med*. 2007;356:1648-55.
2. Perry S, Shaw C, McGrother C, Matthews RJ, Assassa RP, Dallosso H, et al. Prevalence of faecal incontinence in adults aged 40 years or more living in the community. *Gut*. 2002;50:480-4.
3. Madoff RD, Parker SC, Varma MG, Lowry AC. Faecal incontinence in adults. *Lancet*. 2004;364:621-32.
4. Cooper ZR, Rose S. Fecal incontinence: A clinical approach. *Mt Sinai J Med*. 2000;67:96-105.
5. del Río C, Biondo S, Martí Ragué J. Incontinencia fecal. Valoración del paciente. Tratamientos clásicos. *Cir Esp*. 2005;78:34-40.
6. Hill K, Fanning S, Fennerty MB, Faigel DO. Endoanal ultrasound compared to anorectal manometry for the evaluation of fecal incontinence: A study of the effect these tests have on clinical outcome. *Dig Dis Sci*. 2006;51:235-40.
7. Hetzer FH, Hahnloser D, Clavien PA, Demartines N. Quality of life and morbidity after permanent sacral nerve stimulation for fecal incontinence. *Arch Surg*. 2007;142:8-13.
8. Tjandra JJ, Dykes SL, Kumar RR, Ellis CN, Gregorczyk SG, Hyman NH, et al. Practice parameters for the treatment of fecal incontinence. *Dis Colon Rectum*. 2007;50:1497-507.
9. Rieger N, Tjandra J, Solomon M. Endoanal and endorectal ultrasound: Applications in colorectal surgery. *ANZ J Surg*. 2004;74:671-5.
10. de Leeuw JW, Vierhout ME, Struijk PC, Auwerda HJ, Bac DJ, Wallenburg HC. Anal sphincter damage after vaginal delivery: Relationship of anal endosonography and manometry to anorectal complaints. *Dis Colon Rectum*. 2002;45:1004-10.
11. Dudding TC, Vaizey CJ, Kamm MA. Obstetric anal sphincter injury: Incidence, risk factors, and management. *Ann Surg*. 2008;247:224-37.
12. Escalapez-Valero JP, García-Botello S. Valor actual de la ecografía endoanal en el diagnóstico de la enfermedad proctológica benigna. *Cir Esp*. 2005;78:8-14.
13. Starck M, Bohe M, Valentin L. Results of endosonographic imaging of the anal sphincter 2-7 days after primary repair of third- or fourth-degree obstetric sphincter tears. *Ultrasound Obstet Gynecol*. 2003;22:609-15.
14. Dudding TC, Pares D, Vaizey CJ, Kamm MA. Predictive factors for successful sacral nerve stimulation in the treatment of faecal incontinence: A 10-year cohort analysis. *Colorectal Dis*. 2008;10:249-56.
15. Sultan AH, Kamm MA, Hudson CN, Nicholls JR, Bartram CI. Endosonography of the anal sphincters: Normal anatomy and comparison with manometry. *Clin Radiol*. 1994;49:368-74.
16. Starck M, Bohe M, Valentin L. Effect of vaginal delivery on endosonographic anal sphincter morphology. *Eur J Obstet Gynecol Reprod Biol*. 2007;130:193-201.
17. Voyvodic F, Rieger NA, Skinner S, Schlotthe AC, Saccone GT, Sage MR, et al. Endosonographic imaging of anal sphincter injury: Does the size of the tear correlate with the degree of dysfunction?. *Dis Colon Rectum*. 2003;46:735-41.
18. Navarro A, Rius J, Hoyuela C, Collera P, García Domingo MI, Marco C. Aplicación de la ecografía endoanal en el estudio de la incontinencia. *Cir Esp*. 1999;66:392-6.
19. Bordeianou L, Lee KY, Rockwood T, Baxter NN, Lowry A, Mellgren A, et al. Anal resting pressures at manometry correlate with the Fecal Incontinence Severity Index and with presence of sphincter defects on ultrasound. *Dis Colon Rectum*. 2008;51:1010-4.
20. Sultan AH, Kamm MA, Talbot IC, Nicholls RJ, Bartram CI. Anal endosonography for identifying external sphincter defects confirmed histologically. *Br J Surg*. 1994;81:463-5.
21. Norderval S, Dehli T, Vonen B. Three-dimensional endoanal ultrasonography: Intraobserver and interobserver agreement using scoring systems for classification of anal sphincter defects. *Ultrasound Obstet Gynecol*. 2009;33:337-43.