Effect of Age, Gender, and Type of Trauma on the Correlation between Size of Sphincter Defect and Anal Pressures in Post-Traumatic Fecal Incontinence

By

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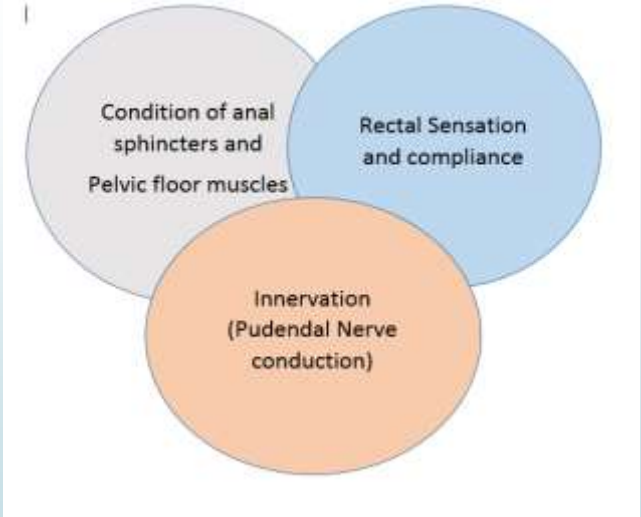
Background

- The mechanism of anal continence is rather complex as it relies on several integrating factors such as capacity of rectal reservoir, degree of rectal sensation, consistency of fecal matter, competent innervation, and integrity of sphincter mechanism.
- The most important factor among these factors is the integrity and function of anal sphincters.

- Fecal incontinence (FI) is a socially disabling condition with negative impact on patients' quality of life.
- Traumatic conditions causing damage to anal sphincters have the highest prevalence among causes of FI.
- Traumatic injury of the anal sphincters may occur after anorectal surgery, obstetric trauma, or an accident.

- Management of post-traumatic FI requires careful assessment of sphincter condition.
- Standard investigations include anorectal manometry, endorectal ultrasound (ERUS) or pelvic magnetic resonance imaging (MRI) to detect any defects in external and internal anal sphincters.
- Other diagnostic tests may contribute to the assessment process as electromyography (EMG) of the anal canal, and pudendal nerve terminal motor latency (PNTML) to assess the integrity of pudendal nerves



Physiologic concept

- Since the continence mechanism relies on various collaborative factors, a defect in one factor would be compensated by other intact factors.
- Therefore, we can expect that a defect in anal sphincters caused by trauma would affect the overall continence state but not to a remarkable degree, as long as the other associated factors are intact.
- If the association between anal sphincter defect and anal pressure/symptoms score was significant beyond what is anticipated, a co-existing problem in one or more of the other collaborative factors should be investigated.

Wasserberg N et al. Three-dimensional endoanal ultrasonography of external anal sphincter defects in patients with fecal incontinence: correlation with symptoms and manometry. Colorectal Dis. 2011 Apr; 13(4):449-53.

Aim of the work

- The primary objective of the current study was to investigate the presence and extent of correlation between size of anal sphincter defect detected by ERUS, anal pressures measured by manometry, and clinical symptoms assessed by Wexner continence grading scale in patients with post-traumatic FI.
- Our secondary objective was to study the effect of patients' age, gender, and type of trauma on this correlation.

Patients

- Records of 70 patients fitting the eligibility criteria of the study were retrieved from the archives of colorectal surgery unit of Mansoura University hospitals in the period of April 2010 to December 2015.

Eligibility Criteria

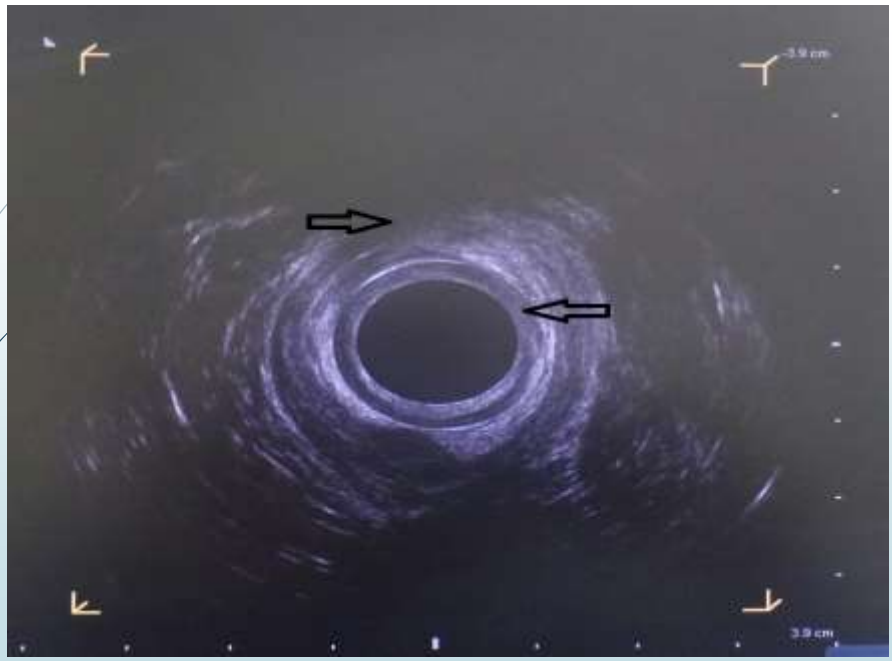
- Only patients with FI induced by trauma were included in the study. We excluded patients with FI caused by other etiologies such as rectal prolapse, rectoanal intussusception, neurogenic factors, and encopresis.
- Patients with incomplete records missing some of the vital data required for the study as ERUS findings or anal pressures were also excluded from the study.

Variables assessed

- Demographic data of patients (name, age, gender and duration of complaint).
- Detailed history regarding the type and timing of trauma that caused FI.
- Details of obstetric history of female patients.
- Wexner continence score.
- Results of clinical examination.
- Results of anorectal manometry and ERUS.

- Conventional manometry was performed using a standard low compliance water perfusion system and eight-channel catheters with pressure transducer connected to 5.5 mm probe with spirally located ports at 0.5-cm interval which measures the pressure along the length of the anal canal.
- We followed the stationed pull through technique, recording functional length of the anal canal (FL), mean maximum resting pressure (MRP), and mean maximum squeeze pressure (MSP).
- Normal ranges of MRP and MSP were 40-80 mmHg, and 80-160 mmHg, respectively.

- ERUS was performed using a FlexFocus 400 Ultrasound Scanner, The probe was inserted inside the rectum with the patient in left lateral position.
- The EAS was evaluated for any defects, then the number, size, and site of defects were recorded. An EAS defect was defined as a hypoechoic defect with homogenous or mixed echogenicity within the EAS ring.
- IAS thickness was measured and recorded and the IAS ring was assessed for any defects.
- The EAS and IAS rings were described in a clock-wise manner, with 12 o'clock being anterior and 6 o'clock being posterior.
- The size of defect was described as a percentage volume of the circumference, where a defect observed at 1-2 o'clock represented 8.3% of the entire circumference. Position of defects was referred to as anterior, posterior, and lateral.



Statistical Analysis

- Pearson correlation coefficiency test was used for analysis of data.
- Correlation coefficients were classified as strong (-1.0 to -0.5 or 0.5 to 1.0), moderate (-0.5 to -0.3 or 0.3 to 0.5) and weak (-0.3 to -0.1 or 0.1 to 0.3).
- A two tailed p value of <0.05 was considered to be significant.

Results

- Seventy patients (54 males and 16 females) with post-traumatic FI were included in this study.
- Mean age of patients was 35.7 ± 15.7 years (range, 6-70 years).
- MRP was 42.2 ± 16.1 mmHg (range, 13-95 mmHg)
- MSP was 79.9 ± 35.5 mmHg (range, 32 – 206 mmHg).
- Mean Wexner continence score was 14.8 ± 4.2 (range, 4-19)

Causes of post-traumatic FI

Cause of fecal incontinence	Number of patients (%)	
Anorectal surgery (fistulectomy)	22 (31.4)	
Anorectal surgery (Hemorrhoidectomy)	13 (15.5)	
Anorectal surgery (internal sphincterotomy)	1 (1.1)	
Anorectal surgery (Delorme's procedure)	2 (2.8)	
After operation for congenital anomalies	8 (11.4)	Post-PSARP = 4
		Post-Soave= 3
		After repair of vestibular anus= 1
Accidental trauma	17 (24.2)	Perineal Impalement =1
		Gunshot = 1
		Road traffic accident = 15
Obstetric injury (complete perineal tear)	7 (10)	Spontaneous tear during labor =5
		Episiotomy = 2

Results of ERUS

- Regarding the size of sphincters defect, 88.5% of patients had solitary defect in EAS, 31.4% of patients had solitary defect in IAS, and 27% of patients had combined defects in both sphincters.
- Mean percentage of EAS defect was 29.1 ± 12.9.
- Regarding the position of EAS defects, there were 32 lateral defects (18 on the left side and 14 on the right side), 18 anterior defects, and 12 posterior defects.

Correlation between percentage of sphincter defect and anal pressures

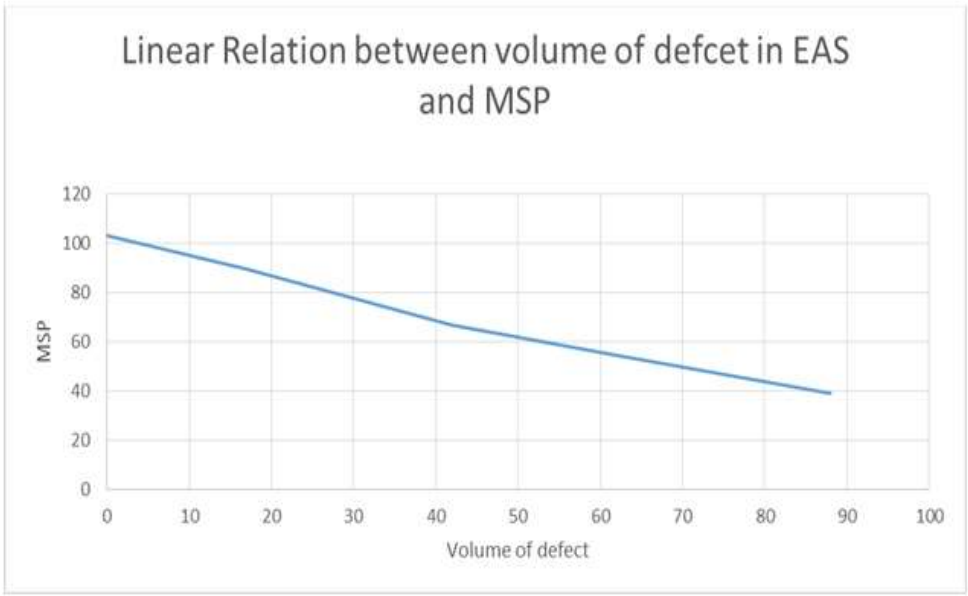
- There was weak negative correlation between percentage of EAS defect and MSP **(r = - 0.4298).**
- Females had stronger negative correlation **(r = - 0.5726)** than males **(r = - 0.3976).**
- patients aged above 50 years had stronger negative correlation **(r = - 0.5619)** than patients under 50 years **(r = - 0.3717).**
- Post-fistulectomy cases and female patients with obstetric injuries had strong negative correlation **(r = - 0.6556 and - 0.6384, respectively).**
- Post-hemorrhoidectomy cases, patients with accidental trauma to the perineum, and patients who developed FI after operations for congenital conditions had weaker negative correlation **(r = - 0.2553, -0.4614 and -0.1129, respectively).**

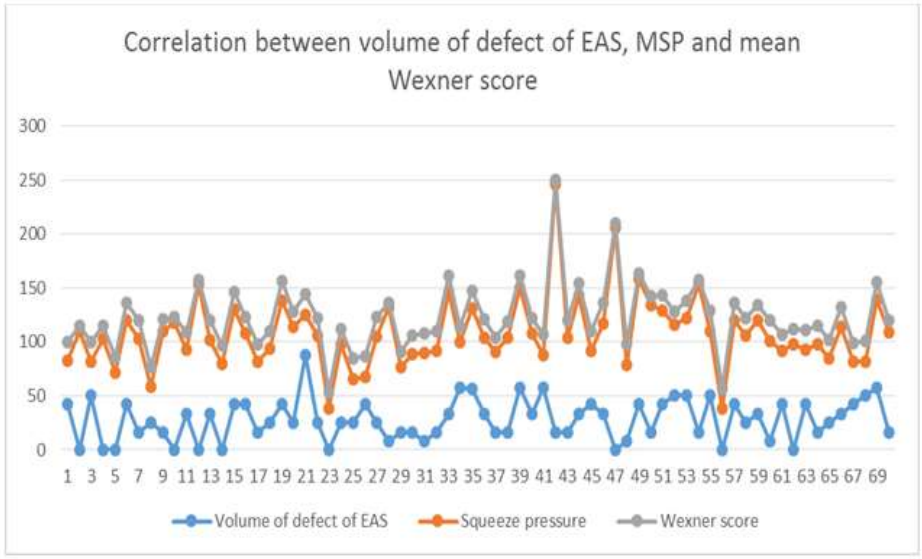
Group	Correlation between percentage of EAS defect and mean squeeze anal pressure	P value
Overall	-0.4298	0.0002
Male	-0.3976	0.002
Female	-0.5726	0.02
< 50 years	-0.3717	0.005
> 50 years	- 0.5619	0.023
Post-fistulectomy cases	-0.6384	0.001
Post-hemorrhoidectomy cases	-0.2553	0.4
Accidental trauma	-0.4614	0.06
Obstetric injuries	-0.6556	0.11
After operations for congenital abnormalities	-0.1129	0.79

Correlation between mean Wexner score, mean maximal squeeze anal pressure, and size of EAS defect

- Mean Wexner score had strong negative correlation with MSP **(r = - 0.7749)** which was statistically significant (p value < 0.00001).
- On the other hand, mean Wexner score had positive correlation with percentage of EAS defect **(r = 0.3743)** with p value of 0.001.
- This positive correlation became significantly stronger in female patients, patients above 50 years, post-fistulectomy cases, and patients with obstetric injuries **(r = 0.6613, 0.5326, 0.5636 and 0.7998, respectively)**

Group	Correlation between percentage of EAS defect and mean Wexner score	P value
Overall	0.3743	0.001
Male	0.2961	0.029
Female	0.6613	0.005
< 50 years	0.3817	0.004
> 50 years	0.5326	0.033
Post-fistulectomy cases	0.5636	0.006
Post-hemorrhoidectomy cases	0.3922	0.18
Accidental trauma	0.3826	0.12
Obstetric injuries	0.7998	0.03
After operations for congenital abnormalities	0.1754	0.67





Conclusion

- Size of EAS defect is negatively correlated with MSP and is positively correlated with clinical symptoms score.
- This correlation becomes stronger in females, patients above 50 and patients with fistulectomy-induced or obstetric injuries.
- This observation is probably attributed to other associated factors in these patients as pudendal neuropathy, weak pelvic floor and sphincter muscles, and diminished rectal sensation and/or compliance.
- This may indicate that this group of patients requires further physiologic assessment of anal sphincters and pudendal nerve latency before conducting definitive surgical repair.

Effect of age, patient's sex, and type of trauma on the correlation between size of sphincter defect and anal pressures in posttraumatic fecal incontinence

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Background. *The physiologic assessment of anal sphincters in cases of posttraumatic fecal incontinence is a fundamental step in planning operative treatment. In this study, we evaluate the correlation between size of anal sphincter defect, anal pressures, and clinical symptoms in patients with posttraumatic fecal incontinence. We also investigate the impact of patients' age, sex, and type of trauma on this correlation.*
Methods. *Records of 70 patients fitting the study's eligibility criteria were collected retrospectively from the archives of Mansoura University Hospitals' colorectal surgery unit. Demographic data of patients, causes of fecal incontinence, images of sphincter defects on endorectal ultrasonography, anal resting and squeeze pressures, and Wexner continence scores were collected, and correlation analysis was performed.*
Results. *Seventy patients (54 males and 16 females) with a mean (±standard deviation) age of 36 ± 16 years were studied. Mean maximal resting anal pressure was 42 ± 16 mm Hg, and mean maximal squeeze anal pressure was 80 ± 35 mm Hg. Size of external anal sphincter defect was negatively correlated with mean maximal squeeze (r = −0.4298). Mean Wexner continence score was correlated positively with size of external anal sphincter defect (r = 0.3743). Both correlations became significantly stronger in female patients, patients greater than 50 years, postfistulectomy patients, and patients with obstetric injuries.*
Conclusion. *Size of external anal sphincter defect correlates negatively with mean maximal squeeze and positively with symptoms score. This correlation is stronger in females, patients greater than 50 years, and patients with postfistulectomy or obstetric injuries. These findings suggest that this group of patients requires additional assessment before surgical repair. (Surgery 2016;■■■:■■■.)*

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