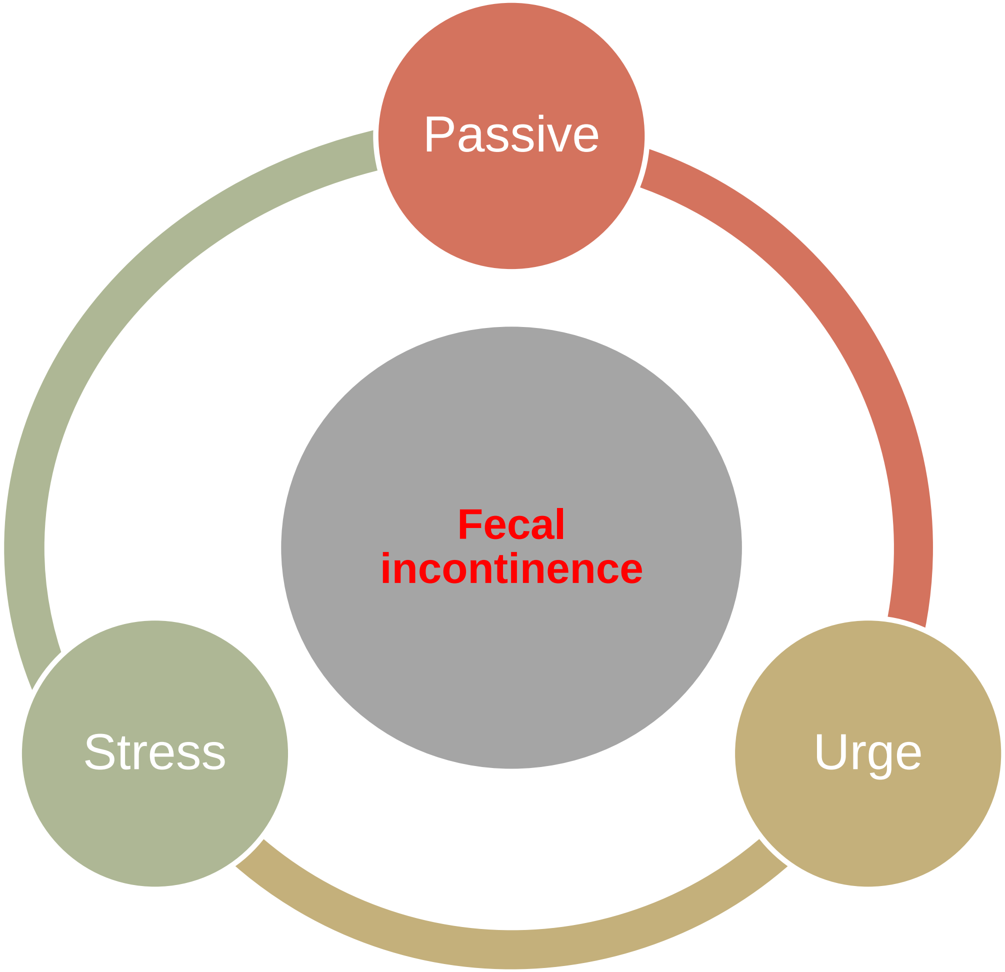
FECAL INCONTINENCE: intraoperative adjustment of the repair

DEFINITION:

Fecal incontinence is involuntary loss of rectal contents (feces, gas) through the anal canal and the inability to postpone an evacuation until socially convenient

(Rao SS. 2004)

CLASSIFICATION:

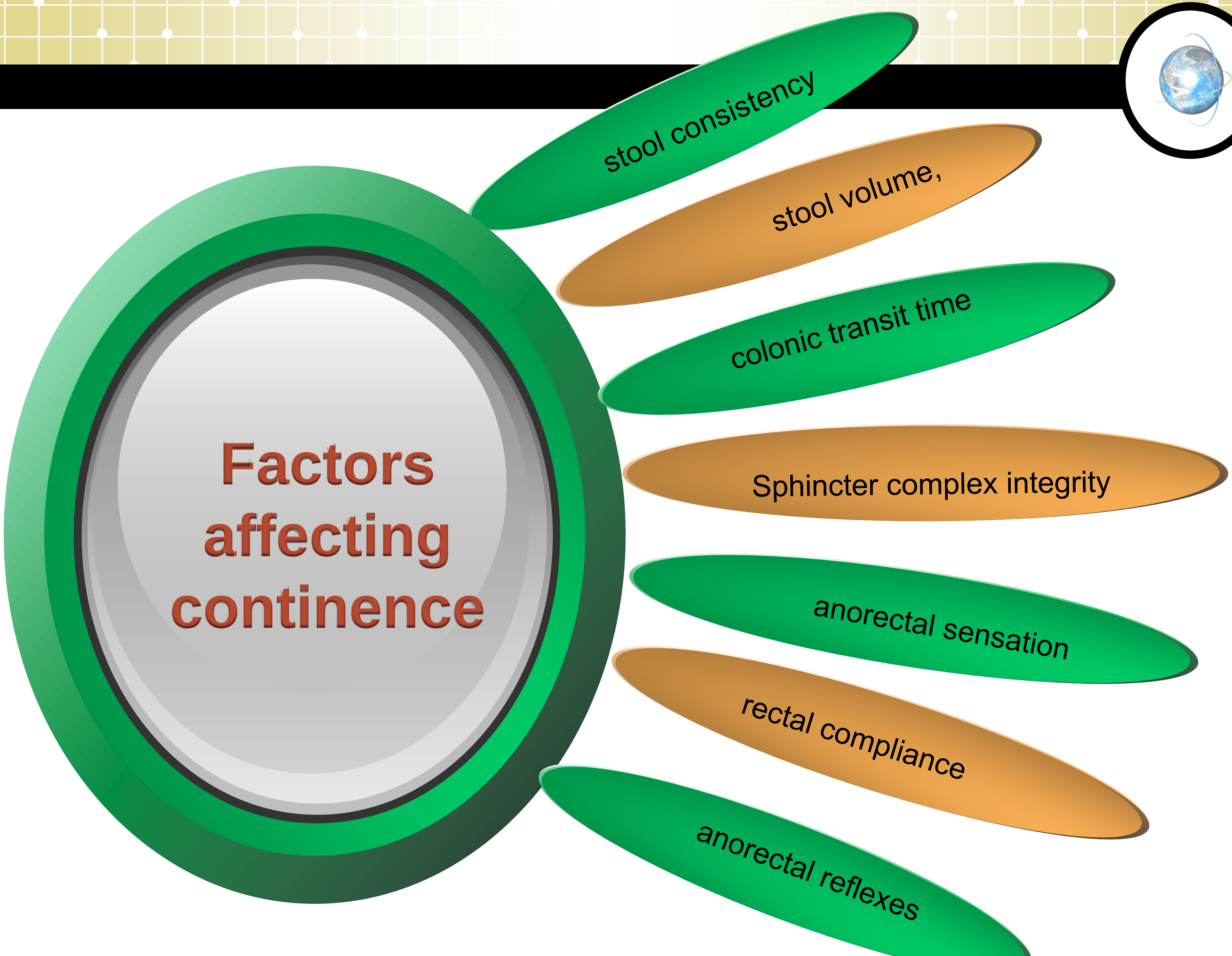


The knowledge about the physiology and pathophysiology of the anorectal continence remains sketchy in many aspects, particularly in correlating subjective and objective parameters in a way to allow for prediction of outcomes and absence of instruments to measure and quantitate fecal incontinence.

(Paquette IM. Et al., 2015, Kaiser AM, 2009 and Alavi K, et al., 2015)

Successful management of patients with fecal incontinence requires a good understanding of the underlying normal mechanisms and the interaction of different components that contribute to achieving fecal control.

(Ruiz, N. S., & Kaiser, A. M. 2017)


Factors affecting continence
stool consistency
stool volume,
colonic transit time
Sphincter complex integrity
anorectal sensation
rectal compliance
anorectal reflexes

The lack of answers to the question on how the anal sphincter works is mainly due to the fact that, the anorectal segment is functionally highly integrated and should be studied using an integrated approach.

(Farag A. 2000 and Bush, M., et al., 2012).

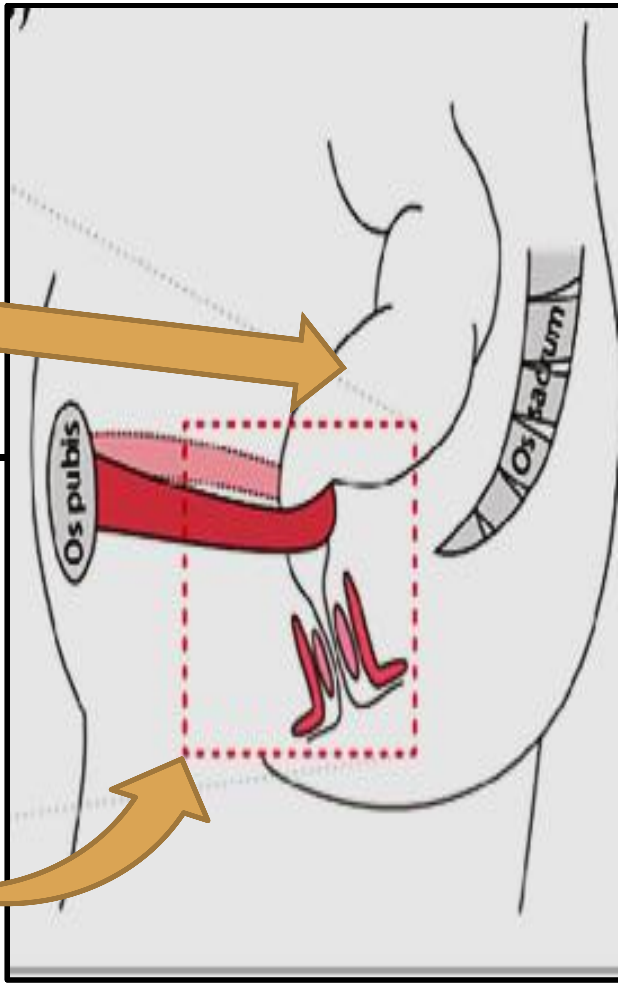
The flow equation (Hagen-Poisuille law):

$$\text{Flow (F)} = \frac{\text{pressure change (P)}}{\text{Resistance (R)}}$$

It was designed to study flow of fluids.

In 1998, Farag A. applied the flow equation for the integration of anorectal physiology trying to understand *how the anal sphincter works*?

Flow (F)= $\dfrac{\text{pressure change (P)}}{\text{Resistance (R)}}$



Small changes in the geometry of the anorectum can produce large changes in the forces required to expel feces.

(Bush, M., et al, 2012).

Using the Flow equation as a mathematic Model, the Anal Canal Length and Diameter are the final Common pathway of the Function of the anal sphincter, the Pelvic floor muscles and reflexes work during continence and defecation.

Functional luminal imaging probe (FLIP)

A novel modality used in measuring the anal canal dimensions.

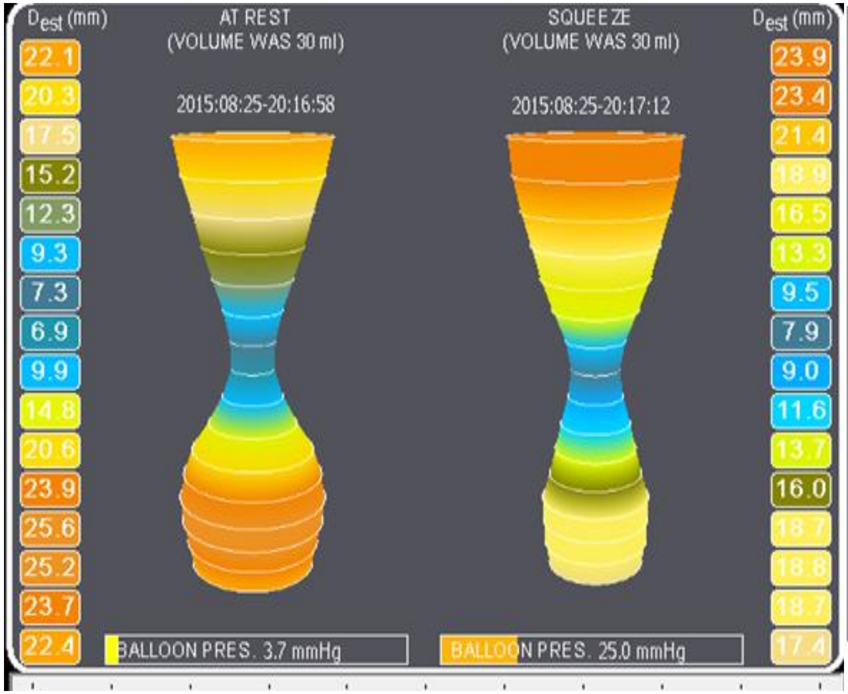


FIGURE 1. EndoFLIP System

FLIP has been developed for assessment of lumen size and sphincter dispensability in the gastrointestinal tract.

(McMahon, B. P., et al., 2005).

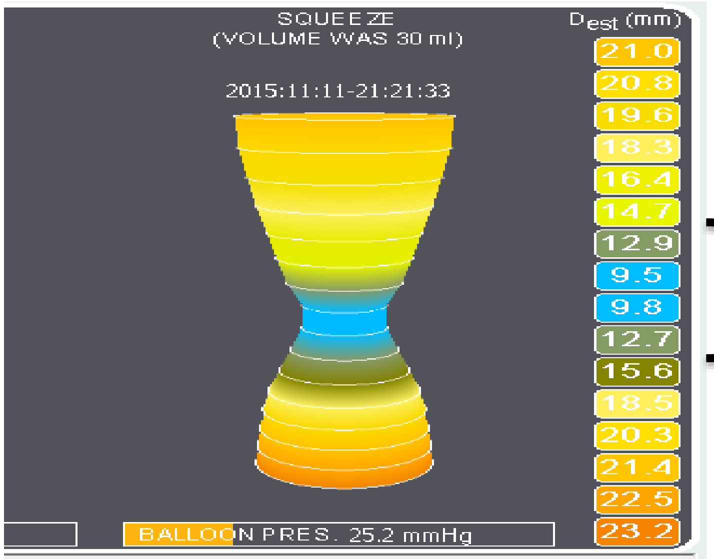
The length of the anal canal (ACL) = number of blue electrodes and each is half cm apart.

The average anal canal diameter (ACD) = the sum of diameters/ their number.

Passive ---------- During Rest.

Urge ------ During Squeeze.

Stress -------During Cough.



The intraoperative use of Endo-FLIP was applied in various upper GI procedures including per oral esophageal myotomy (POEM) ,laparoscopic Heller’s myotomy for achalasia and post pneumatic dilatation for esophageal stricture.

(Teitelbaum E.N., et al., 2015 and Ngamruengphong S., et al., 2016).

In 2015 Farag A. and O’Dea,J. used intraoperative Endo-FLIP during unilateral gluteus maximus transposition for end stage incontinent male who achieved significant clinical improvement. They reported that the anal canal length was increased from 1 cm to 3cm after gluteus maximus transposition.

METHODOLOGY

36 patients were enrolled from Colorectal unit, General surgery department, Kasr Al-Aini hospital, Cairo University.

Patient selection:

Inclusion criteria:

Patients with major fecal incontinence due to anal sphincter complex injury who were candidates for operative repair.

Exclusion criteria:

- Unfit for surgery.
- <4 years or >75years.
- Patients eligible for non-operative management.
- Incontinence due to cause other than sphincter damage.

Preoperative evaluation:

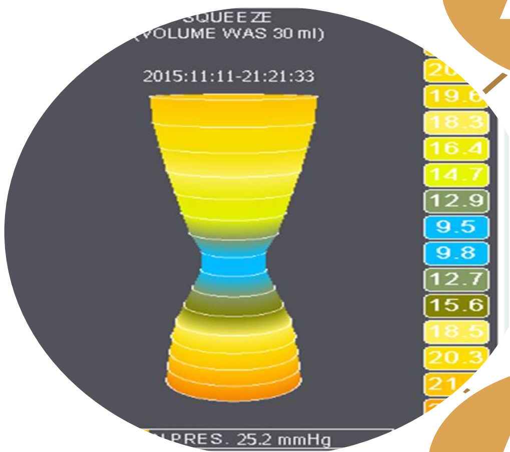
- History:

Subjective parameters of the fecal incontinence.

Assessment the disease severity by Wexner's score

- Examination.

ACL



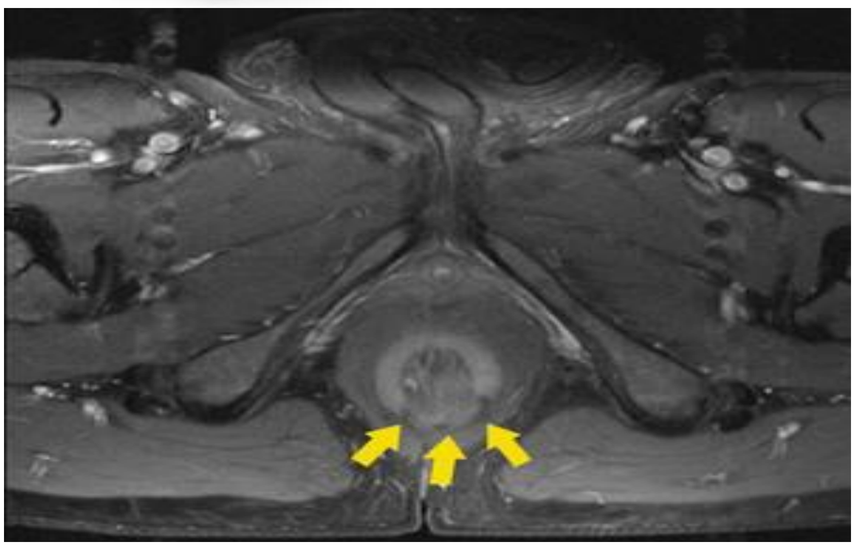
ACD

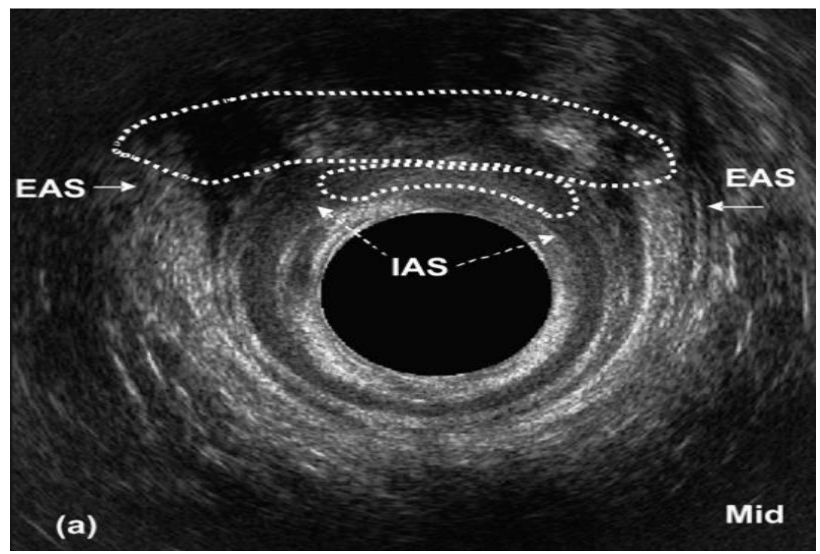
(http://www.integratedcoloproctology.com/calf2.htm).

ACR

Decision making:

Morphological assessment:





According degree of sphincter damage:

- Sphincteroplasty
- Unilateral Gluteus Maximus Transposition

Intraoperative:

Anesthesia: general anesthesia without muscle relaxation.

Position:

- Jack knife position for gluteus maximus transposition.
- Lithotomy position for sphincteroplasty.

Repair adjustment:

The mean ACL in normal volunteers during rest was:

- 3.26 ± 0.53 cm by TRUS ***(Reginelli, A. et al, 2012).***
- 3.28 ± 0.63 cm by transvaginal US ***(Olsen I. P.et al.,2011).***
- 3.25 ± 0.6 cm as High pressure zone area in ARM ***(Fenner, D. E., et al. 1998).***
- 3.13 ± 0.58 cm by EndoFLIP ***(Sørensen G. et al. 2013).***

The inner diameter of the internal sphincter ring was measured in the resting state by MRI. It was 7.7 ± 0.8 mm, while in maximum squeeze it was 7.2 ± 0.4 mm ***(Lestar, B., et al. 1992).***

The anal canal resistance was adjusted intraoperatively guided by anal canal length and anal canal diameter obtained from the intraoperative use of Endo-FLIP.

RESULTS

Sphincteroplasty (n = 15)

	Mean (cm)	Standard Deviation	P value
pre AC Length (cm)	**2.17**	**0.52**	
IO AC length	**3.23**	**0.42**	< 0.001
Post AC Length	**2.93**	**0.56**	
Preop. ACD (cm)	**0.94**	**0.12**	
Intraop. ACD (cm)	**0.79**	**0.03**	< 0.001
Postop. ACD (cm)	**0.85**	**0.11**	
Preop. ACR	**2534.8**	**1431.66**	
Intraop. ACR	**5663.46**	**1097.84**	< 0.001
Postop. ACR	**5198.56**	**1340.24**	

Short term follow up:

12 patients (80%) achieved excellent and good clinical response, 2 patients with fair results and only one patient without any improvement.

Gluteus maximus transposition			
	Mean(cm)	Standard Deviation	P value
Preop. AC Length (cm)	1.17	0.62	< 0.001
Intraop. AC length	2.95	0.44	
Postop. AC Length	2.26	0.68	
Preop. ACD (cm)	1.28	0.22	**< 0.001**
Intraop. ACD (cm)	0.82	0.07	
Postop. ACD (cm)	0.98	0.14	
Preop. ACR	475.11	441.15	**< 0.001**
Intraop. ACR	5587.51	1566.15	
Postop. ACR	2375.95	1394.85	

Short term outcome:

14 patients (67%) achieved excellent and good symptomatic outcome, 3 patients (14%) with fair results and 4 patients (19%) without any improvement.


Conclusion

The visualization of the anal canal geometry and using these measurements for input to the flow equation may be used to predict likely surgical outcomes.

Best clinical results were recorded with average intraoperative ACR about ***5825.16***. However, poor response was documented with higher intraoperative ACR so overcorrection should be avoided guided by optimizing the intraoperative resistance.


Thank you