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Increased Anal Resting Pressure Following the Ripstein Operation

A Contribution to Continence?

BO HOLMSTRÖM, M.D., GÖRAN BRODÉN, M.D., ANDERS DOLK, M.D., BJÖRN FRENCKNER, M.D.

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To investigate the physiology of improvement in continence following the Ripstein operation for procidentia, preoperative and postoperative anorectal manometry was performed on 11 patients. The mean maximum anal resting pressure increased from 39 to 55 mm Hg ($P = 0.01$). This probably reflects improved function of the internal anal sphincter, which might contribute to better continence by increasing the closing capacity of the anal canal. [Key words: Ripstein operation; Rectal prolapse; Anorectal manometry; Continence]

THE RIPSTEIN OPERATION for procidentia has a low recurrence rate. In addition, it improves continence[1-3] by mechanisms that are unknown. When rectal prolapse is associated with incontinence the maximum anal resting pressure and the maximum squeeze pressure are reduced.[4-8] In incontinent patients with internal rectal procidentia maximum anal resting pressure is also reduced.[9] When continence is improved following surgery it is reasonable to expect it to be associated with improved sphincter function. Studies using anorectal manometry preoperatively and postoperatively to investigate this issue are few and the results are conflicting. Some authors report increased maximum anal resting pressure and maximum squeeze pressure following surgery,[7] and others do not.[4,6,8] Thus, there is disagreement as to whether or not the anal sphincters might improve following operative reduction of a rectal prolapse. The maximum anal pressure and the rectosphincteric relaxation reflex were studied preoperatively and postoperatively to investigate the internal anal sphincter and its possible contribution to continence in these patients.

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Address reprint requests to Dr. Brodén: Department of Surgery, Karolinska Institute, Danderyd Hospital, S-182 88 Danderyd, Sweden.

From the Department of Surgery, Karolinska Institute at Danderyd Hospital, and the Department of Pediatric Surgery Karolinska Institute at St. Görans Hospital Danderyd, Sweden

Patients: Eleven patients suffering from procidentia (internal N = 4, external N = 7) were included in this study. Each was subjected to anorectal manometry as described below prior to and about six months after surgery.

Surgical Technique: The operation was performed as described earlier.[10]

Anorectal Manometry: The principle of this investigation is to record the anal pressure and its responses to rectal distention. At rest, anal pressure is maximal at the level of the internal sphincter. The pressure recorded here, the maximal anal pressure, is considered to be almost entirely generated by the internal anal sphincter.[11-12] In response to rectal distention, anal pressure falls due to relaxation of the internal anal sphincter.[13-15] This relaxation is temporary, and anal pressure soon returns to its original level. When rectal distention is pronounced, however, the relaxation becomes constant until rectal distention has ceased[16-19] (Fig. 1).

Anal pressure was recorded at the level of the internal anal sphincter, using the cuff of a Portex endotracheal tube No. 5.0. The outer end of the tube was cut so that its

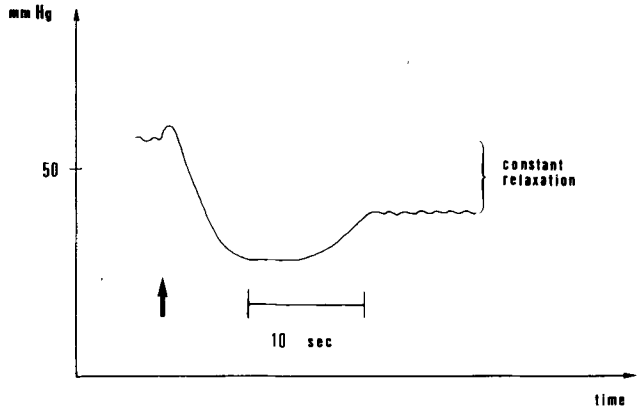

FIG. 1. Constant relaxation. Arrow indicates substantial rectal distention.

total length was 13 to 14 cm. The cuff then was filled with water via a thin polyethylene tube connected to the recording equipment. Finally the amount of water was adjusted, so that the cuff was expanded but the pressure inside did not exceed zero. Rectal distention was achieved with a latex balloon. When empty, this measured 1.5 × 2.0 cm. It was connected to a polyethylene tube about 50 cm long with an internal diameter of 2.0 mm. This tube led to the recording equipment via a three-way stopcock, through which air could be inflated into the balloon. The recording equipment consisted of a pressure transducer (Stratham P 23), amplifier (Grass 7 P1) and recorder (Grass 7), separately on each line from the rectal balloon and the anal cuff, respectively.

The patients were lying in the left supine position with the hips flexed 90°. First a brief recording was made of resting anal pressure and later the rectal balloon was filled with air in 50-ml portions until the patient complained of discomfort. This level of rectal distention was called the maximum tolerable volume. The drop in anal pressure following distention with 50 ml was categorized $relax_{50}$.

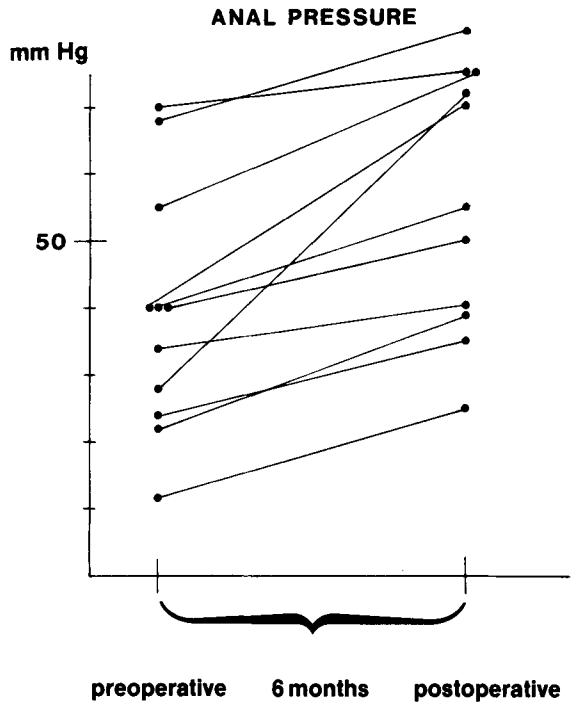

FIG. 2. Maximum anal resting pressures in 11 patients prior to and six months following surgery.

Results

Results are shown in Table 1. Four patients were continent prior to surgery. Another four gained continence following surgery. The maximum anal resting pressure increased in all patients (Fig. 2). There was no change in maximum tolerable volumes.

Discussion

Maximum anal pressure and $relax_{50}$-pressure increased following the Ripstein operation. This probably reflects improved function of the internal anal sphincter.

When the internal anal sphincter is stretched manually, as in the treatment of anal fissure, there is a temporary decrease in maximum anal pressure.[20] Within a week it returns to normal, indicating recovery of that muscle. A similar mechanism might be present in rectal prolapse, which acts as a mechanical dilator of the anal canal. Depending on the size and duration of the prolapse, there will be variable degrees of stretching of the internal anal sphincter. In patients with a long history of rectal prolapse and a gaping anal canal, the internal anal sphincter may be so defective that recovery following the Ripstein operation could not be expected. In patients with a short history and remaining closing capacity of the anal canal, recovery of the internal anal sphincter could be expected

TABLE 1. *Anorectal Manometry and Continence in 11 Patients Before and After the Ripstein Operation for Procidentia*

	Preoperative	Postoperative	*P* (paired *t* analysis)
Continent patients	4	8	—*
	mean ± SD		
MAP (mm Hg)†	39 ± 19	55 ± 20	0.01
$Relax_{50}$ (mm Hg)‡	18 ± 14	33 ± 21	0.01
MTV (ml)§	305 ± 80	268 ± 85	N.S.

*— = No statistical analysis performed.

†MAP = Maximum anal resting pressure.

‡$Relax_{50}$ = Anal pressure reduction following rectal distention by 50 ml of air.

§MTV = Maximum tolerable volume.

on the same grounds as following manual stretching. Thus, there is a great difference between individual patients in the expected ability of the internal anal sphincter to recover following surgery. This individual variation makes any small patient population sensitive to sampling error. Some of the disagreement regarding sphincter function preoperatively and postoperatively probably, can be ascribed to the fact that the patient populations are not identical in factors such as age, duration, and severity of disease. A rectal prolapse that presents externally only on straining might be present as an internal rectal procidentia between periods of straining.[21] By producing substantial rectal distention it might cause constant relaxation of the internal anal sphincter (Fig. 1). Thus, a rectal prolapse might inhibit the internal anal sphincter functionally before it causes mechanical dilatation. This mechanism could explain how incontinence may develop in patients with internal rectal procidentia that is otherwise difficult to explain. After operative reduction one would expect immediate recovery. Preliminary results in our clinic one week postoperatively seem to support this view.

Thus, maximum anal pressure is low in patients with rectal prolapse and increases following surgery. Theoretically, this can be explained by reversible influence on the internal anal sphincter acting in two ways: mechanically by dilatation, and functionally by inhibition.

Is internal anal sphincter recovery the cause of continence improvement following surgery?

Maintenance of fecal continence in the normal individual is a complex phenomenon. One important factor seems to be the anorectal angle created by the resting tone of the puborectalis muscle.[18] In the normal individual this angle is about 90° in the resting state. It is the anatomic basis for the flap-valve mechanism suggested by Parks.[22] When the continence mechanism is stressed by rectal contents or increased abdominal pressure, or both, the puborectalis muscle contracts.[23] This makes the angle more acute, and with increased pressure on the anterior rectal wall the inner aperture of the anal canal closes firmly. In the normal individual, the resting tone in the anal canal produced mainly by the internal anal sphincter seems to be of little or no importance in maintaining continence. In elderly people, however, there may be weakness of the puborectalis muscle and consequently violation of the flap-valve mechanism.[22] Under these circumstances, continence depends to a greater degree on the closing effect of the internal anal sphincter. A similar situation is probably present in patients with rectal prolapse and incontinence, since there is strong evidence of denervation injury to the puborectalis and external sphincter muscles in some of these patients.[5] Since the Ripstein operation is not expected to decrease the anorectal angle,[24] improvement in continence following this operation might be due to increased closing capacity of the anal canal as a result of recovery of the internal anal sphincter.

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