



Duhamel procedure: a comparative retrospective study between an open and a laparoscopic technique

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Abstract

Background: Few studies are available comparing open with laparoscopic treatment of Hirschsprung's disease. This study compares a laparoscopic series of 30 patients with a historical open series of 25 patients.

Methods: The charts of all patients having had a Duhamel procedure in the period from June 1987 through July 2003 were retrospectively reviewed. Open procedures were performed until March 1994. Patients with extended aganglionosis, pre-Duhamel ostomy, or syndrome were excluded from the study. End points were intraoperative complications, postoperative complications, time to first feeding, hospital stay, and outcome at follow-up such as stenosis, enterocolitis, constipation, fecal incontinence, and enuresis.

Results: Twenty-five patients had an open Duhamel (OD) and 30 had a laparoscopic one (LD). There were no differences in patient characteristics and there were no intraoperative complications in either group. Time to first oral feeds was significantly longer in the OD group as was the duration of hospital stay. No significant differences at follow-up were observed but there was a tendency for a higher enterocolitis rate in the LD group. In contrast, for the adhesive obstruction and enuresis rates were higher in the OD group. Cosmetic results were superior in the LD group.

Conclusions: Except for a significantly shorter hospital stay and shorter time to first oral feeds in favor of LD, no significant differences could be observed. The cosmetic result was not an end point but there was no doubt that it was better in the LD group. Although not statistically significant different, there were no adhesive bowel obstructions in the LD group compared with 3 of 25 in the OD group. Fecal incontinence was not encountered in either group.

Key words: Aganglionosis — Hirschsprung — Duhamel — Laparoscopy — Child

The treatment of Hirschsprung's disease has become less invasive over the years. For a long time the surgical treatment was performed in three tempi: the creation of a proximal diverting ostomy, resection of the aganglionic bowel segment, and restoration of bowel continuity. Since the 1990s the operation is usually performed in one session, without ostomy [1–3]. In several centers the operation is now undertaken shortly after birth, eliminating the need for bowel washouts in the period between diagnosis and definitive surgical treatment.

More recently minimal access techniques have been introduced for taking biopsies to determine the proximal extension of the disease and for dissection of the aganglionic part of the bowel to be removed [4–6]. Transanal resection of the aganglionic colon has also been performed without taking biopsies at the beginning of the operation in cases with presumed classic extension of the disease [7].

The treatment for Hirschsprung's disease in our institution has been the Duhamel technique for a long time. With the introduction of minimal access techniques in the early 1990s, we developed a laparoscopic variant of the open technique and published preliminary results in 1995 [4]. There is little doubt that the laparoscopic variant of the open Duhamel leads to less pain, a quicker recovery, and better cosmesis, but the question arises whether the operation is as safe as the open one and whether the functional results are comparable. In this study we compare a series of laparoscopic Duhamel procedures with a historical series of open Duhamel procedures.

Materials and methods

The charts of all patients who underwent a Duhamel procedure in the period from June 1987 through July 2003 were retrospectively ana-

lyzed. From June 1987 through March 1994 the Duhamel procedure was performed in an open way (OD), and from March 1994 through July 2003 it was performed laparoscopically (LD).

To obtain a relatively homogeneous group of patients, patients were excluded from the study for the following reasons: preoperative colostomy, extended aganglionosis, trisomy 21, Waardenburg syndrome, or other associated malformations.

Preoperative bowel preparation consisted of antegrade washout until the effluent became clear [8].

The laparoscopic technique was described earlier [4]. In short, the extension of the aganglionosis was diagnosed by frozen section examination of seromuscular biopsies taken during surgery. Originally the dissection of the rectum was performed circumferentially up to the pelvic floor, allowing the rectal stump to be closed transanally. The latter was difficult and required considerable traction on the stapled side-to-side anastomosis in order to reach the upper part of the stump [4]. The technique was therefore modified. The anterior dissection was limited to just below the peritoneal reflexion, while posterior dissection was done up to the pelvic floor. Dissection of the bowel in the proximal direction was close to the bowel wall up to a good location for a biopsy. Either the rectum was amputated at the level of the peritoneal reflexion after placing a proximal ligature around the rectum to prevent leakage or the mobilized colon was everted through the anus. The everted rectum was then transected under traction close to the anus, while the bowel was further exteriorized up to the good biopsy location. The everted bowel was then amputated and closed. The everted bowel was reintroduced into the abdomen as was the remaining rectum.

About 0.5 cm above the dentate line a transverse incision was made in the posterior rectal wall and the retrorectal space was entered to meet the space dissected from above. The proximal end of the bowel was grasped, pulled through, and anastomosed circumferentially with the created opening in the posterior rectum. A side-to-side anastomosis was then made between the anterior aganglionic rectum and the posterior pulled-through ganglionic bowel using an EndoGIA (blue cartridge 3.5cm long; Tyco Healthcare) under laparoscopic control. Usually two cartridges needed to be fired. Finally, the upper rectum was closed laparoscopically with a running 2 × 0 Vicryl suture. Outcome measures included postoperative complications, hospital stay, and long-term outcome such as constipation, enterocolitis, fecal incontinence, enuresis, stenosis, and adhesive obstruction.

The data were statistically analyzed by using SPSS v9.0 (SPSS Inc., Chicago, IL). A *p* value of less than 0.05 was considered significant. For comparing weight and age between the two groups the *t* test was used, whereas for hospital stay and start of oral feeding the Mann-Whitney U test was used. Fisher's exact test was used for comparing the postoperative complications and additional surgical procedures. Data are given as mean (range) unless stated otherwise.

Results

In total 117 patients were operated on during the study period. Sixty-two patients underwent an open Duhamel in the period from June 1987 through March 1994, and 55 had a laparoscopic Duhamel in the period from March 1994 through July 2003. After applying the exclusion criteria 25 patients (21 males and 4 females) who underwent an open Duhamel remained and 30 patients (23 males and 7 females) who had a laparoscopic Duhamel remained. Patient characteristics are shown in Table 1. There were no statistically significant differences between the groups with respect to gender or age at the time of operation.

No intraoperative complications were recorded in both groups. The operative time for the open group could not be traced anymore. In the LD group the mean operative time was 4.8 h (range = 2.3–9 h).

Postoperative events are given in Table 2. Two patients in the LD group underwent a second operation in the early postoperative period: One because of leakage of

Table 1. Patient characteristics

	Open Duhamel	Laparoscopic Duhamel
Gender (m,f)	21, 4	23, 7
Age at diagnosis (months)	4.2 (0.13–72.4)	4.6 (0.7–67.8)
Age at operation (months)	6.8 (1.2–74.9)	8 (0.9–72)
Weight at operation (kg)	7.1 (4.5–18.5)	8 (3.2–22)
Operation time (h)	not available	4.5 (2.3–9)

Data given as median (range)

Table 2. Postoperative events

	Open Duhamel (<i>n</i> = 25)	Laparoscopic Duhamel (<i>n</i> = 30)
Postoperative fever	3	1
Leakage of rectum stump	0	1
Abscesses	0	0
Start of oral feeding (days)	5.1 (4–8)	3.4 (2–9)
Hospital stay (days)	7.8 (6–13)	6 (3–15)

Table 3. Results at follow-up

	Open Duhamel (<i>n</i> = 25)	Laparoscopic Duhamel (<i>n</i> = 30)
Follow-up (months)	87.8 (7–211)	39.5 (–113)
Reoperation (Duhamel)	1	2
Stenosis	0	2
Obstructive ileus	3	0
Admission for enterocolitis	3	9
Admission for constipation	7	5
Incontinence	0	0
Enuresis	3	0

the rectal stump, which was treated by laparotomy and ileostomy, and the second had laparoscopy because of suspicion of leakage that could not be confirmed. There was a statistically significant difference between the groups with respect to length of hospital stay (*p* < 0.001) and time of first oral intake (*p* < 0.001).

Because of the study design the period of follow-up is different between the two groups. Two patients in the LD group were readmitted for dilatation of the anorectum for stenosis. In one of these patients a rectal spur needed to be transected; this was performed under laparoscopic control. In this patient initially only one cartridge had been used. Reoperation was carried out in one OD patient and in two LD patients.

Although statistically not significant, there was a higher incidence of admission for enterocolitis in the LD group. There were more children with adhesive obstruction and with enuresis in the OD group, but again the differences was not statistically significant (Table 3).

Discussion

Hirschsprung's disease is basically incurable. Even when the proximal transection plane of the bowel shows a

normal plexus at pathologic examination, there is no guarantee of a good outcome because the distal rectum is and remains abnormal. The best that surgery can achieve is a delicate balance between constipation and incontinence. More often than not the balance tips in one direction. End points are difficult to set and final results are therefore difficult to evaluate.

Hirschsprung's disease is a relatively rare disease and is heterogeneous in the sense that its extension varies and that it may be part of a syndrome. To obtain a group of patients that was as homogeneous as possible, many variables in the present study were excluded. The disadvantage of that is that the subgroups become smaller which makes it harder to obtain significant differences between the groups. With these limitations in mind, we can conclude that there was no difference in intraoperative complication rate. Although the operative times for patients in the OD group were not available, the operative times for patients in the LD group were long, which emphasizes that the laparoscopic procedure is not simple. The difference in starting time of oral feeding and in postoperative hospital stay were significantly longer in the OD group. The first seems to be the result of bias as the postoperative feeding protocol changed over the years toward faster introduction of feeding. The same may apply to the shorter postoperative hospital stay in the LD group although this is less obvious. There were no significant differences in postoperative complications or in the follow-up end points. However, relatively more patients in the LD group were readmitted for enterocolitis, maybe more rectum is left behind with LD. Better functional results have been reported when a short rectal pouch is left [8]. Although not statistically different, adhesive bowel obstruction was seen in the OD group only and the same applies for enuresis. The cosmetic results were definitely better in the LD group.

Conclusion

The laparoscopic variant of the Duhamel procedure is not simple, as reflected by its long operation time. There seems to be no essential difference between the open and the laparoscopic procedure with respect to postoperative complications or functional results at follow-up. Although there is a tendency for a higher enterocolitis rate in the LD group, lower adhesive obstruction and enuresis rates were encountered. There is no doubt that the LD is cosmetically superior. Despite the fact that the transanal approach is becoming more popular in recent years, there certainly remains a place for the laparoscopic Duhamel–Martin procedure, particularly when extended Hirschsprung's disease is present.

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