

The pull-through: back to the future

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SUMMARY: The pull-through: back to the future.

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Background. Historically, colo-anal pull-through (P-T) has been the first surgical procedure adopted to facilitate a handmade lower anastomosis. Very popular around mid twentieth century, P-T has had poor diffusion, mainly as a consequence of the technical simplifications brought by staplers. Recent literature seems poor on this specific topic, despite description of P-T appears in published series during the reconstructive phase of total laparoscopic proctectomies. A comeback of P-T has also been observed as an option with deferred anastomosis, to allow and protect a colo-anal anastomosis in situations at greater risk of dehiscence, avoiding a temporary faecal diversion.

After reviewing the most significant aspects of classic techniques of P-T, we report our experience with transanal laparoscopic P-T for distal rectal cancer, presenting a new, modified P-T with deferred anastomosis aimed at improving defecatory compliance.

Patients and methods. Between January 2008 and June 2011 we operated in 258 rectal cancers (0-14 cm from the anal verge), 62.79%

of which by laparoscopic access (VL), with 218 restorative procedures (84.49%). The colo-anal anastomoses (CAA) were globally 68 (26.35%), of which 48 in VL procedures (70.58%). In 27 of these CAAs we utilised the P-T procedure, with immediate CAA (I-CAA) in 11 cases (all VL) and delayed CAA (D-CAA) in 16 (2 VL), by selective indications. All CAAs were manually fashioned; 6 D-CAA had the addition of a transverse coloplasty. Site of tumor was the lower rectum in 24 patients, with 21 patients receiving preoperative chemoradiation.

Results. There was no operative mortality. Early morbidity: D-CAA: 3 pelvic abscesses with stoma formation. I-CAA: 1 intraoperative re-resection and colo-anal anastomosis with stoma formation for defective distal vascular supply. Late morbidity: anastomotic stenosis in 5/12 I-CAA and 4/14 D-CAA controlled by mechanical dilation. **Function:** 4/7 D-CAA and 4/6 I-CAA nearly complete functional recovery (Kirwan's 1 or 2).

Conclusion. There are selective indications to P-T, when resection and anastomosis is not feasible in one step, or also as a primary restorative option in elective cases when a covering stoma is refused or dangerous.

KEY WORDS: Pull-through - Laparoscopic - Transanal - Rectal cancer - Delayed colo-anal anastomosis - Sphincter function.

Introduction

The reconstruction of natural intestinal continuity after an unavoidable colorectal resection has always been among the primary objectives of surgeons.

Historically after a few less fortunate attempts at transsacral rectal resection with direct anastomosis (1), the first successfully reproducible restorative procedure was realized by Hochenegg (2) in 1888; he performed a colo-rectal anastomosis by invagination, a method that he named "durchzug", which means "through".

That primitive concept of pull-through (P-T), performed in one time by posterior access, was followed by several modifications: with eversion of the residual rectal stump, immediate anastomosis and reintroduction in the pelvis (3, 4) or, without eversion, by posterior and transanal access (5), or by two steps, abdominal and perineal (6). With the introduction of new principles on oncological radicality that led to the success of Miles' operation (7), the P-T significantly evolved, thanks to Babcock (8) and Bacon (9). They developed the concept of a restorative procedure, that can be obtained after removal of the rectum, through a delayed colo-anal anastomosis (D-CAA). Babcock used to complete the resection by posterior access to the pelvis, sectioning the sphincter and the levator ani, then he proceeded to reconstruction by means of P-T, leaving in place the anal epithelium. Bacon instead, was used to remove the mucosa of the anal canal along with the in-

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ternal sphincter, with the aim of obtaining a quicker and safer sealing of the exteriorised colon. Initially he too used to section the external sphincter then, in the following years, described the respect of both sphincters. These techniques (known as Babcock-Bacon P-T) had large diffusion in the 50s in the anglosaxon countries. Their rationale was to perform a restorative procedure but with the same finalities of clearance and eradication as the Miles' procedure, which is the excision of the whole rectum together with the resection of the pelvic fascia and diaphragm, and dissection of the ischio-rectal fossae. The functional results of this procedure, as firstly reported by the Authors, could no longer be reproduced, and this induced to modifications then described by Black (10), Toupet (11), by Cutait (12) and contemporarily by Turnbull (13).

However, even though not free from morbidity and consequences, with cramped and often incomplete recovery of continence, the method of P-T had success until the whole 70s for the acknowledged merit of making the construction of distal anastomoses easier, and additionally making possible the fashioning of an immediate but also of a delayed anastomosis. A delayed reconstruction was fashioned by maintaining the distal end of the colic stump exteriorised through and beyond the anus, for the time necessary to the healing of an upstream anastomosis between a cranial portion of the colonic stump and the rectal residue or the anal canal. It was thus possible to achieve the double goal of avoiding a protective stoma and minimizing the risk (and relative consequences) of a dehiscence.

In the 80s the improved knowledge of anorectal physiology and above all the advent of mechanical staplers conditioned the rapid decline of P-T (14), which reduced to few indications and was also forgotten in the scientific reports as many surgeons from the last generations did not have any knowledge of it, neither direct nor historical (the last generations had their training in schools where P-T was never utilized). Besides, when checking recent publications of large series of rectal resections, we realize that many cases of immediate colo-anal anastomosis (I-CAA) are reported as still fashioned by P-T, but called otherwise (15, 16).

The little interest dedicated to the topic may also have put under silence further evolutions of the procedure. In 1990 we too described a modification of the Babcock-Bacon P-T (17) (Figures 1, 2), updated to the latest findings in surgical anatomy and anorectal physiology, and to the modern criteria of "sharp" (precise and less traumatic) pelvic and transanal dissection: total proctectomy with TME that was completed through a combined transabdominal and perineal access; during the endoanal phase we avoided any dissection or eversion of the anal canal, to preserve the integrity of the mucosal plane; however, even with these precautions, 54% of the patients treated

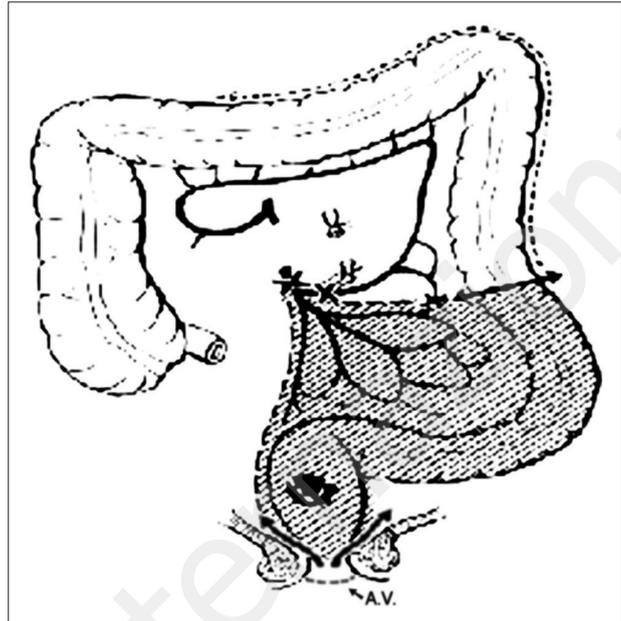


Fig. 1 - Modified pull-through: excision scheme, with respect to the anal canal. A.V.: anal verge.

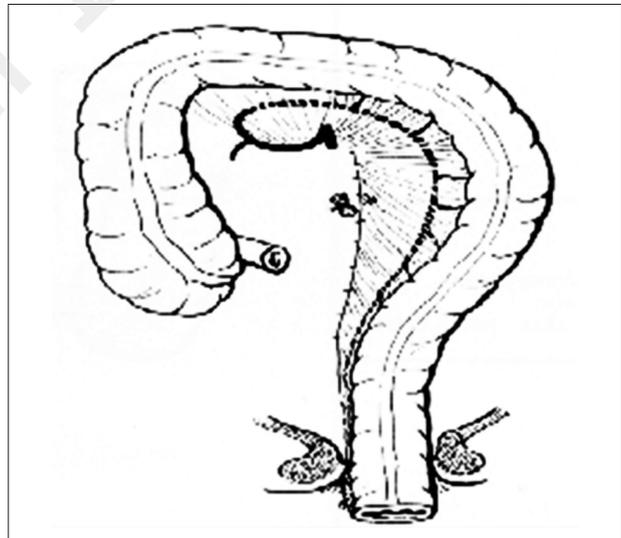


Fig. 2 - Scheme of modified pull-through. Reconstructive time: D-CAA without excision or eversion of the anal mucosa.

ted in that period were still manifesting significant defecatory frequency and urgency, and recurrent minor incontinence a year after the procedure.

Later on, with the advent of J-pouch, we verified a significant improvement in functional results compared to straight colo-anal reconstructions (18).

P-T with D-CAA was then an option reserved to only a few sporadic necessary indications (as restorative re-

resections, reconstructions in pelvic fibrosis after abscesses or radiations, recto-urethral or recto-vaginal fistulas), and it always and only was used for colo-anal anastomosis in patients with intact anal sphincter.

In the last 10 years P-T has been put again in the surgeons' agenda for both I-CAA and D-CAA. In the growing experience of videolaparoscopic (VL) colorectal operations, P-T has integrated the philosophy of minimally invasive surgery, allowing for restorative resections with no service laparotomy (15, 16, 19). Moreover, the significant increase in risk of anastomotic leakage produced by the wide diffusion of TME, by the general tendency to perform lower anastomoses (also in VL) and by the use of multimodal preoperative treatments for mid-lower rectal cancers, has suggested again the need for more effective means of anastomotic protection, among which D-CAA could be a valid option (20-22).

Anastomotic dehiscence and pelvic abscess not only are severe, potentially life-threatening complications, but also impact on the duration and costs of hospital admission; also, in CAA, even a modest leakage with time often ends up in seriously compromising - in many ways - the recovery of sphincter efficiency (23).

With these considerations in mind we aim at presenting our recent experience with selective use of P-T as a restorative option after total proctectomy (TP) or intersphincteric resection (ISR), in both VL and open procedures. We will discuss indications and evaluate outcome of transanal P-T. We will finally present preliminary results of P-T with delayed coloanal anastomosis (D-CAA) when a transverse coloplasty (TC) is added.

Patients and methods

Between January 2008 and June 2011 we operated on 258 rectal cancers (0-14 cm from the anal verge), 62.79% of which by VL access. The patients (62% of which were male) had a mean age of 64.6 years (range 28-89). The resection procedures (radical or palliative) were 255 (98.83%), of which 218 restorative (84.49%), 21 conservative (transanal excisions, either conventional or TEM - 8.13%), 10 amputations (Miles' procedure - 3.87%), 6 Hartmann's (3.32%), 3 palliative stomas (1.16%).

The colo-anal anastomoses (CAA, defined by the suture sitting at +/- 1 cm from the dentate line) were globally 68 (26.35%), of which 48 VL (70.58%) and 20 open.

Focus of this study are 27 of these CAAs, in which we utilized the P-T procedure, with a restoration of intestinal continuity that was immediate (I-CAA) in 11 cases and delayed (D-CAA) in 16. So our study group is made by 27 P-T procedures, performed in 26 patients (14M/12F, mean age 65,38 years).

All I-CAAs were performed laparoscopically, after exteriorization and resection of the surgical specimen through the anus, and with temporary ileostomy. D-CAAs were performed open in 14 cases and VL in 2 cases. There were selective indications for D-CAA, limited to complex pathological situations (14 re-intervention for recurrence or failure of mechanical low colorectal anastomosis and 2 severe limitations to a protective stoma).

All CAAs were manually fashioned. With regard to the anastomotic model, I-CAA has been associated to a small J-pouch in 9 cases; in 2 cases a direct reconstruction (without interposition of a pouch) was unavoidable, but was always side-to-end. As of D-CAA, in 6 cases (5 VL + 1 open) a TC has been added.

The site of tumour was in the lower rectum (<6 cm from a.v.) in 24 patients. Clinical T stage was: 4 T4, 17 T3, 3 T2, 2 T1.

In cancers classified Stage IIa or above after investigations (always including digital rectal exam and ERUS/MRI), an integrated treatment was adopted. Integrated treatment was predominantly preoperative chemoradiation (long course in 20, short in 1 case), postoperative in only 2 cases.

Systematic follow-up clinical, biochemical and imaging tests have been adopted for all patients, every three months for the first year and every 6 months from the second year onwards. To record the progress of sphincter activity and of defecatory function, we utilized a questionnaire standardized according to Kirwan's classification (24).

Data relative to surgical complications and oncological and functional results were gathered and recorded according to a univocal prospective protocol. The uniformity of technical behaviour and patients' care are guaranteed by presence of a dedicated surgical team and by the same lead surgeon for all cases.

The P-T technique (following total proctectomy)

Excision time

Abdominal phase

In primary rectal cancers the procedure does not differ from a standard low anterior resection: mobilization of the left colon from the retroperitoneum and of the epiploon up to half of the transverse colon; haemostasis and section of the inferior mesenteric vessels to their origin; incision of the insertion of the transverse mesocolon up to the trunk of the mid colic vessels; haemostasis and section of the left colic vessels close to the IMV; incision in the avascular area of the transverse mesocolon near the left colic arcade, to obtain the maximum elongation of the remaining colon for reconstruction.

In re-resections it is often possible that the left colon is not sufficiently long for its transposition in the pelvis, and sectioning the mid colic vascular axis becomes necessary. In these cases if a vascular supply can be ensured from the right colic vessels, it is convenient to mobilise and turn down the transverse colon to the right of the small bowel, so that the bulk of the small bowel loops is moved towards the left paracolic gutter, with no need to derotate the caecum. If, because of a short course, not even the right colic vessels can be spared, it will become necessary to complete the liberation of the residual colon, relying on perfusion coming from the leio-colic axis. The caecum is then rotated and overturn, and the proximal ascending colon is moved down to the level of the perineum.

Pelvic phase

The rectum, when still present, is dissected down to the pelvic floor with standard TME technique. Then, once the superior border of the puborectalis muscle is reached, dissection converges circumferentially towards the rectal wall, controlling completeness of dissection with finger rectal exploration.

In case of reintervention for local recurrence or low Hartmann's resection, pelvic dissection is far more complex, given the need to isolate from the existing scar the small rectal stump, usually walled off by the fall of the genito-urinary organs towards the back. It is convenient to firstly proceed posteriorly on the presacral plane and then, once landed below the ureters, extend the dissection laterally and towards the front, accurately avoiding the hypogastric veins. To facilitate the isolation of the anterior plane we can use a blunt probe (Haegar-type) of adequate calibre, pushed through the anus or

the vagina. If the intact residue of rectum isn't longer than 2 cm we can skip the isolation of its external aspect and rely on a mucosectomy instead, during the perineal phase.

Perineal phase

The anal canal, intact and left in place, is gently divaricated – better if not with a self-retaining retractor – and a circumferential incision at the level of the pectinate line is performed. If necessary for oncological purposes, part of the anal canal can be resected, but with care to respect the integrity of the mucosa (and the internal sphincter) of its most distal segment for at least a centimetre from the skin margin. Dissection proceeds then upwards in the intersphincteric plane until the other abdominal end is reached.

Once isolation is complete, four interrupted stitches in re-absorbable monofilament are respectively positioned in four cardinal points on the internal border of the anal canal, passing through the sphincter.

When the surgical specimen is not too bulky it can be pulled out through the anus (together with its meso and the inferior mesenteric vessels), taking care that the mucosa of the anal canal is not inverted outside or lacerated during the pull through. The exterior-

ised colon is then trimmed at a level appropriate to the type of planned reconstruction that has been planned, carefully verifying its vascular supply.

Reconstructive time

When there are no particular foreseen risks, an I-CAA is our primary option. Preferred configuration for the anastomosis is side-to-end. Whenever possible we add a J-pouch of 5-6 cm, which in VL procedures is fashioned outside the anus (Figure 3), then reduced back in the pelvis until the level of the service incision is matched, and finally stitched to the four cardinal points. CAA is then completed with a single layer of interrupted re-absorbable sutures.

In cases where the probability of dehiscence is high, and when it is also necessary to avoid a protecting stoma, the alternative is a direct D-CAA: 5-10 cm of the distal colonic stump, with a short posterior meso, are left outside the anus for 7-10 days, anchored to the cardinal points only (Figure 4); then the colon extending beyond the anal verge is resected and the anastomosis completed with our usual technique (Figures 5, 6).

In the last few years P-T with D-CAA has been supplemented – when possible – with a TC fashioned 4 cm upstream the defini-



Fig. 3 - Laparoscopic transanal pull-through: preparation of colonic J-pouch (before fashioning I-CAA).



Fig. 5 - Aspect of colonic transanal stump seven days later.



Fig. 4 - Pull-through, completed: 4 cardinal stitches between the external layers of colonic wall and the anal canal.



Fig. 6 - Immediate recover of sphincteric tone by the end of delayed CAA, after trimming redundant colon.



Fig. 7 - Scheme of pull-through with transverse coloplasty.

tive site planned for the CAA (Figure 7): the reservoir is realized by longitudinal incision (8 cm) and then closure with transverse suture, a single layer of slow-reabsorption stitches (25, 26) (Figure 8). Preliminary results of such a modification look promising (27) (Figure 9).

Results

There was no operative mortality in the study group.

Early postoperative morbidity

1) D-CAA

Early postoperative morbidity was recorded in 4 P-T with D-CAA, performed on 3 patients.

Two males had pelvic abscesses following necrosis and subsequent retraction of the exteriorised colon: they both required covering stoma; one of these stomas was made after a reconstruction with the addition of a transverse coloplasty (TC).

Finally, a young woman operated in 2008 for colovaginal fistula secondary to former anterior resection performed at another Institution, developed diverticular perforation in the postoperative period, and a second P-T with D-CAA was realized by mobilising the right colon; this procedure was complicated by the development of a pelvic abscess in the 4th postoperative day, requiring a covering stoma that the patient did not wish to take down later on.



Fig. 8 - Completion of TC. Arrow points at a stitch marking the site where future CAA is being fashioned.



Fig. 9 - CAA with TC. Follow-up contrast study.

2) I-CAA

Among the P-Ts with I-CAA, in one case the laparoscopic control at the end of the anastomosis revealed the absence of a vascular arcade between the left colonic flexure and the descending colon, anticipating insufficient vascular supply to the anastomosis: this procedure was converted to open surgery with further resection, colo-anal anastomosis with the right colon and protective ileostomy.

There was no clinical evidence of leakage in the group of I-CAA, but a routine contrast study before closure of a covering stoma revealed in two cases a short and blind fistulous tract, that was kept under observation until delayed closure.

Late morbidity

Anastomotic stenosis due to scarring, with need of progressive dilation treatment presented in 5/12 patients with I-CAA and 4/14 with D-CAA (1/6 with TC).

A moderate scarring anastomotic stenosis was common, and more marked in I-CAA due to the former functional exclusion caused by the stoma deviation; this was however rapidly controllable with the use of calibrated probes.

Follow-up

At the last control one patient is dead from disease progression, one for other causes. There were two pelvic recurrences (one of which with liver secondaries), and systemic metastases in four patients. There have been 3 permanent stomas (2 after failed procedure and one for metachronous neoplasm causing repeat colonic resection); 3 ileostomies were not closed at the time of FU.

In the first trimester, after restoration of transit through the anus all the patients presented incontinence Kirwan's grade 4 or 5, with increased frequency and faecal fragmentation.

At 6 months, 11 of 16 patients eligible for follow-up check (6/9 D-CAA and 5/7 I-CAA) referred significant improvement with inconstant minor incontinence, reduction of frequency and urgency. A woman with liver metastases and rigid stenosis following D-CAA complained for poorly controllable defecation; other 4 patients (3 D-CAA and 1 I-CAA, all of them with no colonic pouch added) presented medium grade incontinence and other alterations of function significantly limiting their habits.

Among the patients valid at 1 year for functional check during follow-up, 4/7 D-CAA (including all the two with TC) and 4/6 I-CAA have obtained a nearly complete functional recovery (Kirwan's grade 1 or 2).

Discussion

The number of patients in the present case series and the difference in reconstruction models are a limit to the power of a statistical study and do not allow final conclusions. Still some considerations can be made, in the light of our previously published experience and contributions from the relevant literature.

P-T with I-CAA

If in partial or subtotal rectal resections the technique known as "anterior resection" with stapled anastomosis seems generally accepted and well standardised - despite the available choice of reconstruction models (E-E, S-E, K-G) - we cannot speak of the same acceptance and standardisation when we consider the reconstructive phase of total rectal excisions or intersphinc-

teric resections. In this case P-T still appears today a valid option to complete the procedure.

Every time a sphincteric complex in good functional state can be saved and an I-CAA in VL can be performed, P-T is an efficient measure to avoid any form of service laparotomy. Limitations to this approach are of oncological and anatomical order: the passage of a surgical specimen through the anal canal is contraindicated in case of neoplastic involvement - even suspect - of the circumferential resection margin (CRM+); the same when, because of volume and consistency of the lesion we fear to force excessively an anal divulsion. This occurrence however is infrequent nowadays, not just because tumour stage can often be anticipated, but also because of the downsizing and the likely downstaging that follows neoadjuvant treatments.

Besides, transanal transposition of a previously mobilised colon does not impede fashioning a pouch and reduce it back in the abdomen, and offers a double advantage: a clear identification of the appropriate site for a tension-free anastomosis, and direct check of the vascular supply to the distal colon before sectioning the mesocolon (16, 19).

P-T with D-CAA

Despite the advances in techniques and in technologies applied to surgery, intestinal anastomoses still retain limits of feasibility and chances of failure. We know that the probability of a leakage is inversely proportional to the distance of an anastomosis from the anus (28). Moreover the risks of complications have - paradoxically - increased over the years: the number of restorative procedures performed on the mid-lower rectum has increased; there has been wide diffusion of TME - now more frequently laparoscopic; the diffusion of neoadjuvant therapies increases risks of inflammation and local sepsis, and tends to slow down healing or repair processes of tissues exposed to radiations.

The incidence of anastomotic leak is reported in literature with variable figures from 3 to 25% in relation to the different site of anastomosis (29), to the method used to detect a leakage, to anastomotic models and particularly to the use or not of a protecting stoma when anastomosis is fashioned. In CAA the most favourable estimates of a leakage do not go below 10%; as in all cases of leakage, we have to consider a related high risk of mortality, while poor functional results that can often end up in permanent colostomies. These considerations have convinced the majority of surgeons to adopt a means of protection for low anastomoses.

Temporary stoma is notoriously the most diffuse practice for protection of high risk anastomosis. After lengthy discussions regarding the real advantages of a stoma, a prospective randomized trial by Matthiessen and coll. (30) has definitely demonstrated stoma efficacy in re-

ducing the absolute number of anastomotic leaks and not only their most severe consequences. Nevertheless the incidence of symptomatic anastomotic leaks for patients with preventive stomal protection has been 10.3%, and there is to consider that the study enrolled patients with stapled anastomoses excluding the ultra-low ones. Besides, a covering stoma, other than not being able to guarantee primary healing of an anastomosis and impacting on another side on the duration and costs of hospital stay, has limits in its indications: morbid obesity, patients with hanging pannus or intractable ascites, complex consequences of abdominal wall scarring. A covering stoma also implies a non-negligible morbidity related to stoma fashioning and take-down, and certain forms of negative psychological impact, up to resistance or refusal.

Another resource to protect recto-anal anastomoses, not objectively validated yet, may be the use of transanal drains. The old practice of leaving in situ rubbery tutors (31), capillary drains or Pezzer probes to neutralise intraluminal high pressure has been adjourned to the use of less traumatic shapes and materials (32-34). Judgements on these devices, which are characterized by contradictory results especially when used with CAA, agree in showing poor patient compliance and difficult nursing care (35, 36).

In this scenario a delayed anastomosis is competitive as a means of prevention of specific early complications.

A surgical group from Lyon (20, 21, 37), showing a wide and prolonged experience in the presurgical radiation treatment of rectal cancer, had long ago flagged up an increase in postoperative pelvic sepsis consequent to radiation therapy (RT): in a retrospective analysis of 144 rectal resections following RT the anastomotic leakage rate was 17.3% and protection with a stoma had not reduced the incidence of local septic complications. In consideration of this, adopting a P-T in all aspects similar to ours, they published in 2000 their short- and long-term results on 35 patients who underwent preoperative RT (45 Gy) for low rectal cancer (45 Gy). Only one patient had pelvic abscess, which resolved conservatively; there was no mortality or anastomotic dehiscence. Recovery of sphincteric function at 1 and 2 years was judged good in 59% and 70% of the cases respectively (18).

A recent 10-year retrospective review on P-T with delayed anastomosis at the Cleveland Clinic Foundation (38) on 67 patients operated with Turnbull-Cutait technique for complex anorectal pathology has documented that stable results from this procedure, relative to faecal incontinence and urinary and sexual functions, are comparable to those of manually fashioned CAA. Also postoperative complications are similar in the two experiences, even if anastomotic leaks and pelvic ab-

scences are more than double in I-CAA (6.8 vs 2.9), confirming data from a preliminary study performed years before (24). The high rate of failure of procedure (25%) seems to relate to the somehow extensive indications and to the severity of the pathologies considered, rather than to the type of P-T they utilise; besides, P-T appears associated with protective ileostomy.

Jarry and coll. (39) in 2011 analysed retrospectively P-T with D-CAA as a primary option in 100 patients operated for rectal cancer (inferior tumor margin 2 to 12 cm from the a.v.), of which 75 were VL. The Authors report 3% operative mortality, 36% morbidity (of which 10% relative to anastomotic leak, fistula and pelvic sepsis) and 14% re-interventions. Functional results were judged good or satisfactory in 40% of cases after 1 year and in 73% after 2 years. The Authors consider these figures comparable and competitive with all the I-CAA, and to support this they recall the study from Remzi and coll. (38). Remzi had though reserved D-CAA only to extremely complex local situations and reported on functional results comparable only to manual I-CAA. Finally Jarry and coll. criticize J-pouch as, despite allowing transient reduction of defecatory frequency and urgency, it prolongs duration of the operation, is not always technically feasible and can cause, with time, difficulties in emptying the neorectum. It is however our impression that benefits deriving from a J-pouch have been underestimated, as there are numerous studies (40-42) (also confirmed by our experience) demonstrating that by the first year a pouch allows the recovery of continence in about 80% of patients and that respect to straight CAA, improved functional results are evident even after three years (43-45).

P-T with D-CAA and TC

For many years, in the common experience of surgeons who have not renounced to use P-T and D-CAA, indications have remained both selective and restrictive: preferred option has been primary anastomosis - generally protected by covering stoma - credited with more rapid and complete functional results. But we have already noted from the experience of Jarry and coll. a new orientation (although with too extensive indications), towards the preferred and routinary employment of D-CAA. Use of D-CAA is well supported by the reliability of this procedure and by its capacity to contain morbidity and costs compared to I-CAA with stoma protection. There are still reserves on the quality of functional recovery of D-CAA; a similar perplexity can however be helped today by the possibility of adding TC to D-CAA.

TC, described about 10 years ago from Z'graggen and coll. (25) and tried with initial enthusiasm at Cleveland (26), did not have great sequel. Functional results, when compared to J-pouch, have been considered satisfactory

and alternative. Moreover its modest space requirement makes TC utilisable in a narrow pelvis that would not accept a J-pouch. A high early morbidity has however been reported by some Authors (46), and there have been fears of an interference with perfusion of colon distal to the TC, with increased risk for anastomotic integrity, that have limited diffusion of this option.

Roullier and coll. (15) have utilised TC in 32 cases of VL ISR with P-T and I-CAA, but they interrupted its use because of excessive morbidity that was thought to derive from fashioning a TC and positioning it in the pelvis.

Facy and coll. (23), commenting on their case series, are indicating the theoretical possibility of adding a TC to D-CAA but then exclude a practical realization due to the high rate of complications reported from others (47). Our experience does not confirm this: the exteriorized colonic stump opposes to the sphincteric tone of the anus and seems to work as a means of protection for the healing of TC.

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