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Intestinal Anastomosis

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Abstract

Elective intestinal anastomosis is a frequently used surgical procedure in pediatric surgery. Many factors can affect anastomosis site healing or leakage, for example intraoperative contamination, circulation of intestinal bounds, anemia, surgical technique, type of surgery (elective or emergency), tension in suture line; a meticulous effective anastomosis technique is necessary to optimize surgical outcome and minimize anastomotic complications. One of the most serious complications after intestinal surgery is leakage, that can be lethal and it's regarded as a devastating postoperative complication. Because of this, we decide to make this review in order to provide surgeons a guideline to improve anastomosis in the 3 most critical surgical moments: pre, trans- and post-operative.

Introduction

Elective intestinal anastomosis is a frequently used surgical procedure in pediatric surgery. This option is used to restore intestinal continuity (ileostomy or colostomy closure), resolve an inflammatory disease or functional or anatomic congenital malformation [1]. Some aspects must be considered to perform a good anastomosis. Many factors can affect anastomosis site healing or leakage, for example intraoperative contamination, circulation of intestinal bounds, anemia, surgical technique, type of surgery (elective or emergency), tension in suture line; a meticulous effective anastomosis technique is necessary to optimize surgical outcome and minimize anastomotic complications. In addition to preoperative and postsurgical measures [2,3]. One of the most serious complications after intestinal surgery is leakage, that can be lethal and it's regarded as a devastating postoperative complication [4]. Because of this [1], we decide to make this review in order to provide surgeons a guideline to improve anastomosis in the 3 most critical surgical moments: pre, trans- and post-operative.

Preoperative Considerations

Intestinal preparation and antibiotics prophylaxis

Mechanical Bowel Preps (MBP) was initially thought to decrease the bacterial load of the colon and, therefore, decrease infection. Traditional bowel preps include osmotic, laxative and a combination regimen. Data demonstrate that mechanical bowel preps are generally equivalent; however, the addition of oral antibiotics may further reduce the risk of infection [5]. The published evidence examining the prophylactic effectiveness of MBP and non-absorbable oral antibiotics in adult colorectal surgery is fairly extensive. Several meta-analyses incorporating data from high-quality randomized controlled trials have firmly established that non-absorbable oral antibiotics used with or without a MBP significantly reduce complications, while the administration of a MBP alone (without oral antibiotics) provides no benefit [6,7]. Although no published trial has compared oral antibiotics alone with oral antibiotics combined with a MBP, data from two large, prospective, multi-center colorectal outcomes databases have suggested that oral antibiotics combined with a MBP significantly reduce infectious complications compared with MBP alone [6,7]. From this pool of relatively high-quality clinical evidence, two conclusions surrounding colorectal prophylaxis can be reached: 1) Oral non-absorbable antibiotics should be administered (with or without a MBP) as prophylactic adjunct to intravenous antibiotics for elective colorectal procedures, and 2) MBP should never be given alone (without oral antibiotics) for this purpose [8]. The benefit of oral non-absorbable antibiotics as an adjunct to intravenous antibiotics has also been extensively studied. In one study, the addition of oral non-absorbable antibiotics to standard parenteral antibiotics at the time of surgery reduced the risk of surgical site infection by 43% compared with parenteral antibiotics alone [9]. While the evidence in adults studies is clear, it has not been as extensively

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studied in children. One recent multi-center retrospective review of children undergoing colostomy closure showed that MBP actually increased the risk of wound infection (14.4% *vs.* 5.8% [P=0.04]) and length of stay (5.6 *vs.* 4.4 days [P=0.05]), while the addition of oral antibiotics had no effect [10]. Another study of a similar cohort of patients undergoing colostomy closure for anorectal malformation found no benefit in the addition of oral antibiotics to MBP in the rate of infectious complications (13% *vs.* 17% [*P*=0.64]) [11]. To date there have been no prospective studies of any type comparing bowel preparation strategies in the pediatric population. We conclude that all the relevant information that we have on this issue come from studies developed on adults and as we can all agree children are not small adults, therefore High-quality evidence to guide clinical practice in children is sorely needed.

Trans Operative Considerations

Surgical technique

Meticulous and effective anastomotic technique is necessary to optimize surgical outcome and minimize anastomotic complications, factors specific to the pediatric population require surgical consideration, including appropriate manipulation of delicate preterm tissues and discrepancy in luminal diameter encountered during repair of congenital atresia or as a result of derivation following stoma formation [3]. The technique must be perfectly performed. The creation of appropriate apposition and alignment, maintenance of well vascularized bowel and tension-free, equally spaced stitches are all considered essential [3]. The use of single layer anastomosis in gastrointestinal tract is well established. Single-layer anastomosis is as effective in children as a double layer and there is no evidence that use of double-layer anastomosis reduces anastomotic leak [12]. Regarding to material AR Ross et al. [3] recommend polypropylene, a non-absorbable, monofilament suture that elicits minimal tissue reaction and handles well for tying. They believe this suture material minimizes the 'drag' experienced as it passes through tissue. It is also likely that the minimal tissue reaction generated by this material results in minimal scarring and rapid healing [3,13]. The suture used is mounted on a tapered, round bodied, vascular needle which is constructed with a narrow swage that neither dilates nor creates resistance in the tract that the needle passes through. The sutures were interrupted in order to minimize mucosal ischemia, a practice supported by Irwin et al. [14] it also minimizes luminal narrowing by avoiding inversion of the bowel. As the suture material is non-absorbable, an interrupted suturing technique is necessary to avoid circumferential constriction and favor growth factor. In the technique, the mucosa was not included within the suture in order to allow better approximation of mucosal surfaces and edges, the sub mucosal layer provides the necessary strength to the anastomosis, offering a good 'bite' to the suture and minimizing disruption to blood supply and to exclude suture material from the lumen of the bowel [3]. The use of staple device is still under investigation but its use is limited by the size of the bowel lumen, therefore we must take in account this factor before considering applying this technique [15]. It is important to mention that some studies suggest when it is permitted by the intestinal size in infants younger than 1-year, stapled anastomosis is safe and effective and significantly reduced operative time [16]. When it comes to size discrepancy in anastomotic ends there have been only a few methods devised to solve this problem, [15,17-19] but there is still no concluding evidence about the efficiency of any of these techniques, also all the methods should be performed according to the surgeon's experience and skills. We confirm that bowel anastomosis with one layer has been shown to be safe and cause less narrowing of the lumen than the use of two layers, take less time to be performed. Therefore is particularly suitable for its use in pediatric surgery, especially in neonates where the bowel diameter may already be reduced.

Postoperative Considerations

Early feeding *vs.* late feeding

It is a common practice to avoid oral feeding in children after intestinal anastomosis surgery, even though there is little scientific evidence supporting this practice [20]. This is justified by the perception that the fasting would protect the anastomosis from any complication such as abdominal distention, vomiting, ileus, anastomotic dehiscence or leaks, wound infection and would allow a hermetic closure of the anastomosis before the beginning of enteral feeding [21-23]. It is clearly demonstrated that the mucosal epithelium of the bowel is perfectly sealed after the first 24 hours of the post-operatory period [22,23]. According to Davila-Perez et al. [24], it is not necessary to keep the 5-day fasting in order to prevent post-operative complications and should not be used routinely. Obligatory fasting does not provide with any protective role in avoiding complications [1]. There were well-based fundamentals for assuming that it was functionally possible to initiate early feeding (before the 5th postoperative day):

- Clinical and electrophysiological studies that show that the small intestine recovers its function in the first 4 to 8 hrs and the colon in the first 24 postoperative hours.
- The ability of the intestinal mucosa to absorb electrolytes, glucose and nutrients is not affected after intestinal anastomosis.
- The intestinal epithelium is perfectly sealed after 24 hr of intestinal anastomosis.
- Early feeding speeds up healing of the anastomosis and surgical wound in animal models.

Early feeding is clearly related with a lower incidence of nosocomial infections, liver disorder, postoperative stay, bacterial translocation, secondary malnutrition as well as promoting peristalsis, bowel movements and early ambulation in adult patients who are operated [20-26]. ESPEN guidelines recommended early initiation of enteral feeding within 24 hr after gastrointestinal surgery but also state that it needs to be adapted according to the individual tolerance and type of surgery [25]. Initiation of feeding should be progressive and a 24-hr liquid diet should be maintained before beginning a bland diet in case of complications should arise [1]. Gulsen Ekigen et al. [26] reported in their study that early small-volume feed tends to be well tolerated and are valuable regardless of the type of abdominal surgery and in other study the time for reaching a complete diet were significantly earlier in the early feeding group, also hospital stay decreased [1]. According to all the information cited above we agreed that early enteral feeding in pediatric intestinal anastomosis can be safely started without waiting for traditional markers of bowel activity and so, decrease hospital length [20].

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