



Systematic Review

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Preserving Inferior Mesenteric Artery during Elective Laparoscopic Sigmoidectomy for Diverticulitis

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Abstract

Background: To evaluate results after Laparoscopic Sigmoid Resection (LSR) with Inferior Mesenteric Artery Preservation (IMAP) and Superior Rectal Artery Preservation (SRAP), regarding the incidence of anastomotic leakages, denervation of the hypogastric nerves with consequent genitourinary and defecation alterations. **Methods:** A retrospective PUBMED research from January 2000 to January 2020 was conducted enrolling studies about patients with symptomatic diverticular disease and a surgical indication. **Results:** A total of 1685 patients with IMAP and SRAP were included in the study. **Conclusion:** This retrospective review showed that patients with IMAP-SRAP demonstrated lower leakage rate with reduced incidence of stoma, lower incidence of defecation disorders and a good Quality of Life (QoL) compared with laparoscopic left colectomy with no IMAP.

Keywords: Diverticular disease, Diverticulitis, Inferior Mesenteric Artery Preservation (IMAP), Superior Rectal Artery Preservation (SRAP), High Tie, Low Tie, Laparoscopic Left Colectomy.

INTRODUCTION

Diverticular disease is a common cause of morbidity, hospitalization and mortality especially in western countries where it amounts to an incidence of about 60 per cent, mainly in people aged 50 to 70 [1]. Among patients with diverticular disease and who undergo a first attack of acute diverticulitis, clinical studies have shown that as many as one third suffer a relapse and, of these, another third have a new relapse. Of them, near thirty per cent had a recovery with sigmoid resection in the first attack [2,3]. In recent years, the treatment of benign colon diseases such as diverticulitis, has become the gold standard. In particular, during the laparoscopic treatment of diverticulitis, two techniques can be performed with sparing and without sparing the inferior mesenteric artery: the first technique, avoiding mobilization of the rectum and ligation at the origin of the inferior mesenteric artery, seems to allow a lower number of anastomotic dehiscences due to preserved vascularization and above all it seems to achieve a better postoperative course regarding the defecatory and genitourinary capacity of the patient thanks to the sparing of the hypogastric nerves [4-7]. LSR with IMAP/SRAP by sectioning of the sigmoid arteries one by one seems to expose the patient to fewer such morbidities [8]. To evaluate results after Laparoscopic Sigmoid Resection (LSR) with Inferior Mesenteric Artery Preservation (IMAP) and Superior Rectal Artery Preservation (SRAP), regarding the incidence of anastomotic leakages, denervation of the hypogastric nerves with consequent genitourinary and defecation alterations.

MATERIALS AND METHODS

We have reflectively assessed PUBMED. 23 investigations were evaluated from 2000 to 2020. Consideration standards: English language, complete treatment of pathology from determination to medical procedure and catchphrases "diverticular disease, diverticulitis, inferior mesenteric artery preservation, superior rectal artery preservation, high tie, low tie, laparoscopic left colectomy" was inquired about. Rejection rules: not English language, case reports, fragmented conversation on pathology, preserving inferior mesenteric artery for cancer, manuscript below year 2000. Following this rule, we chose only 9 original copies. Two surgeons (DC and SL) revised manuscripts. The object of this review study is to portray the condition of craft of this common pathology.

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RESULTS

Masoni *et al.*^[1] performed 54 IMAP procedures compared with 53 patients with IMA resection (IMAR). For the patients in the IMAP group, the study demonstrated a statistically relevant decrease in the frequency and intensity of gas incontinence, lower soiling and better QoL compared to IMAR group. Mean times was 138 ± 45 for IMAP and 124 ± 51 min for IMAR, respectively with p value of 0.611. The authors concluded that IMAP may sparing the autonomic innervations of the colon and the rectum, which subsequently seems to reduce soiling, urgency, and fragmented evacuation. While IMAR group confirmed that high ligation of the IMA may lead to a denervation of the colonic stump. The quality-of-life evaluation was better in the IMAP group. No percentage of anastomotic leakage was mentioned. A prospective study by Jolivet *et al.*^[9] about high tie of the inferior mesenteric artery for diverticular disease on twenty-five consecutive patients evaluating preoperative and 6 months postoperative bowel symptomatology (Jorge–Wexner Incontinence Score and KESS score), urinary function (IPSS), and sexual function (IIEF), morbidity and quality of life (SF-36) concluded that laparoscopic sigmoidectomy with high tie of the inferior mesenteric artery for diverticular disease does not induce functional disorders at 6 months after surgery and it demonstrated benefit about quality of life comparing with pre-operative time. For what concern leakage, the study talked about 12% of morbidity. No operative time comparing IMAP was made. De Nardi *et al.*^[10] performed a retrospective study comparing IMAP versus IMAR using as primary end point to compare anastomotic leakage in the two groups, and, as secondary end points, to compare operative time, stoma formation, overall post-operative complications, restoration of bowel function and length of post-operative hospital stay on 219 elective sigmoidectomy for diverticular disease. Anastomotic leakage was 4.5% in IMAR and 3.9% in IMAP with non-significant P value, while operative time was 225 ± 43.4 in IMAR group comparing with 191 ± 41.7 min in IMAP, respectively with $P = 0.002$. No differences were observed in the rate of overall complications, stoma formation, restoration of bowel function and post-operative length of hospital stay. The study stated

preservation or ligation of the IMA did not affect leakage rate or morbidity, mortality or operative time. An important systematic review conducted by Cirocchi *et al.*^[11] regarding if preservation of the IMA reduces the risk of anastomotic leakage on with 2190 patients (IMA preservation 1353, ligation 837) using eight studies, demonstrated that The rate of anastomotic leakage was not statistically significant even if higher in the IMA ligation group 6% than the IMA preservation group 2.4%. In this way, this systematic review seems to fail to demonstrate a statistically significant difference in the anastomotic leakage rate when comparing IMA preservation with IMA ligation, even if it demonstrated that the conversion to laparotomy was significantly lower in the IMA ligation group (5.1%) than in the IMA preservation group (9%). A retrospective review by Lehmann *et al.*^[12] about IMAP and Superior Rectal Artery Preservation (SRAP) and anastomotic leakage. There were no significant differences in leak rates when the IMA or SRA was sacrificed (0% and 3.7%), comparing with anastomotic leakage of 9.3% and 6.5% with the vessels preserved. The study concluded IMA or SRA preservation or sacrifice was not associated with an increased leak rate from colorectal anastomoses after sigmoidectomy for diverticular disease. No references was given about operative time while the study stated that hand-sewn anastomoses were associated with a higher leak rate (33% vs 2%; odds ratio, 3.44; 95% confidence interval, 1.514-7.817; $P < .001$) respect to stapled anastomoses. Tocchi *et al.*^[13] performed a retrospective study on 163 patients after a sigmoid resection. Primary goal was anastomotic leakage. They noted that IMAP had inferior anastomotic leakage and a significant lower number of staple-ring disruptions. Mean operating time was superior in IMAP group. Sohn *et al.*^[14] performed a systematic review where only three studies were enrolled with a total of 564 patients were analyzed to view if SRAP reduced anastomotic leakage. SRA was preserved in 305 patients and sacrificed in 259. One study demonstrated a significant reduction of the anastomotic leak rate in the arterial preservation group. One study showed a nonsignificant reduction of anastomotic leakages. In a third study, preservation of the SRA was associated with a no significant increase of leakages.

Table 1: Type of study done

Study	Date- No. of PTS	Authors	QoL	Intestinal Functions	Anastomotic Leak
Randomized, single-blinded	January 2004 to January 2010. (53 pts)	Masoni <i>et al.</i>	Good	Minor incontinence	No leak
Retrospective	January 2015 to March 2016-(31 pts)	Mari <i>et al.</i>	Good post operative quality of life	No differences in the genito urinary function	No leak
Prospective	2020-(25 pts)	Jolivet <i>et al.</i>	Better general health	Good scores for bowel symptomatology urinary, function, and sexual function	No leak
Retrospective	January 2006 to December 2012 (153 pts)	De Nardi <i>et al.</i>	Not calculated	Good restoration of bowel function	3.9%
Randomized and non-randomized clinical trials	2012-(400 pts)	Cirocchi <i>et al.</i>	Not calculated	Not calculated	7.3%
Retrospective	May 2011-(130 pts)	Lehmann <i>et al.</i>	Not calculated	Not calculated	9.3%
Prospective collected database	January 2004 and December 2014-(736 pts)	Posabella <i>et al.</i>	Not calculated	Not calculated	1.2%
Retrospective multicenter analysis	From 2002 to 2015- (157 pts)	Sohn <i>et al.</i>	Favorable outcome	Favorable outcome	1.9%
Retrospective	2001 (163 pts)	Tocchi <i>et al.</i>	Not calculated	Not calculated	Inferior Leakage in IMAP

Table 2: Operative time

Masoni <i>et al.</i>	IMAP and IMAR groups (138 ± 45 and 124 ± 51 min, respectively; p = 0.611)
Nardi <i>et al.</i>	Operative time was 225 ± 43.4 in IMAR group comparing with 191 ± 41.7 min in IMAP, respectively with P = 0.002
Tocchi <i>et al.</i>	Mean operating time was superior in IMAP group

DISCUSSION

Diverticular disease is a common cause of morbidity, hospitalization and mortality especially in western countries where it amounts to an incidence of about 60 per cent, mainly in people aged 50 to 70. During the treatment of diverticulitis, the surgeons prefer the laparoscopic approach and two techniques can be performed with sparing and without sparing the inferior mesenteric artery. In literature, many studies debated if IMAP plus SRA preserving or IMA ligation had a superior results. We conducted a review with this goal. No differences with a P<0.01 were observed in the rate of anastomotic leakage, overall complications, stoma formation, restoration of bowel function and post-operative length of hospital stay. Many data were controversial and seem to demonstrated more conversion rate in IMAP group respect IMAR, more operative time in IMAR group and a moderate advantage in anastomotic leakage in IMAP group. Preservation of genit-urinary, sexual activity seemed superior in IMAP group while QoL seemed to be similar in IMAP and IMAR group^[1,10-14].

CONCLUSION

IMAP / SRAP or not preservation technique were not associated with an significant inferior leak rate as IMAR from colorectal anastomoses after sigmoidectomy for diverticular disease and they are associated with better QoL, good quality of restoration of bowel function, genit-urinary and sexual function respect not IMAP.

Conflicts of interest

None declared.

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Human Rights Statement

All procedures and experiments met the ethical standards.

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