

# Selective extra levator versus conventional abdomino perineal resection: experience from a tertiary-care center

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**Background:** To compare extra levator abdomino perineal resection (ELAPER) with conventional abdominoperineal resection (APER) in terms of short-term oncological and clinical outcomes.

**Methods:** This is a retrospective review of a prospectively maintained database including all the patients of rectal cancer who underwent APER at Tata Memorial Center between July 1, 2013, and January 31, 2015. Short-term oncological parameters evaluated included circumferential resection margin involvement (CRM), tumor site perforation, and number of nodes harvested. Peri operative outcomes included blood loss, length of hospital stay, postoperative perineal wound complications, and 30-day mortality. The  $\chi^2$ -test was used to compare the results between the two groups.

**Results:** Forty-two cases of ELAPER and 78 cases of conventional APER were included in the study. Levator involvement was significantly higher in the ELAPER compared with the conventional group; otherwise, the two groups were comparable in all the aspects. CRM involvement was seen in seven patients (8.9%) in the conventional group compared with three patients (7.14%) in the ELAPER group. Median hospital stay was significantly longer with ELAPER. The univariate analysis of the factors influencing CRM positivity did not show any significance.

**Conclusions:** ELAPER should be the preferred approach for low rectal tumors with involvement of levators. For those cases in which levators are not involved, as shown in preoperative magnetic resonance imaging (MRI), the current evidence is insufficient to recommend ELAPER over conventional APER. This stresses the importance of preoperative MRI in determining the best approach for an individual patient.

**Keywords:** Extra levator abdomino perineal resection (ELAPER); rectal cancer; conventional abdominoperineal resection (APER)

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## Introduction

With a growing economy, the incidence of rectal cancer in India is on the rise, with an estimated age standardized rate of 4.3 and 3.5 per 100,000 in male and female subjects, respectively (1). Currently, the standard curative treatment for rectal cancer consists of radical surgery with total or

partial tumor-specific mesorectal excision depending on the tumor location. Locally advanced tumors have better loco regional control with the use of neoadjuvant chemo radiotherapy, followed by surgery (2). Despite an increasing trend towards sphincter-saving surgery for low rectal cancer, abdominoperineal resection (APER) is still the commonly

performed with reported rates of end stoma of upto 12–30% (3).

Studies have shown that local recurrence rates are higher and overall prognosis is worse for patients with rectal cancer who require APER as compared to those who require anterior resection (4–6). Studies further suggest the possibility of tumor-specific factors being responsible for these adverse outcomes rather than the procedure itself (7). Circumferential resection margin (CRM) positivity is the single most important factor predicting local recurrence and overall prognosis after rectal cancer surgery (8). With conventional APER, CRM positivity rate has ranged between 12% and 15.7% (9,10). One possible explanation for this high rate of CRM positivity is the thinning of the mesorectum distally where the tumor tends to abut the levator complex. This is still more significant for anteriorly located tumors where the mesorectum is virtually nonexistent. This has encouraged the surgeons to reevaluate the current technique and further modify the surgical approach so as to achieve a wider CRM.

Holm *et al.* (11) first described the extralevator APER (ELAPER), which closely resembles the original procedure of APER described by Miles (11). It involves an en bloc resection of the rectum and anal canal along with the entire levator muscle without dissecting the mesorectum from the levator muscles so as to resect the levator muscle at its origin from the arcuate line on the obturator internus muscle. This procedure aims to create a cylindrical specimen without a “waist” so as to reduce the rate of intra operative tumor perforation and CRM positivity. Studies comparing APER with ELAPER have yielded conflicting results (12–15). There is only one randomized control trial that found a lower rate of local recurrence without an increase in complications with ELAPER (16). Two systematic reviews on the issue have shown differing results (14,17). With the inception of a dedicated colorectal unit at our institute, ELAPER has been offered to the patients although with less-stringent selection criteria.

### *Aims and objectives*

To compare ELAPER with conventional APER in terms of short-term oncological and clinical outcomes.

### **Methods**

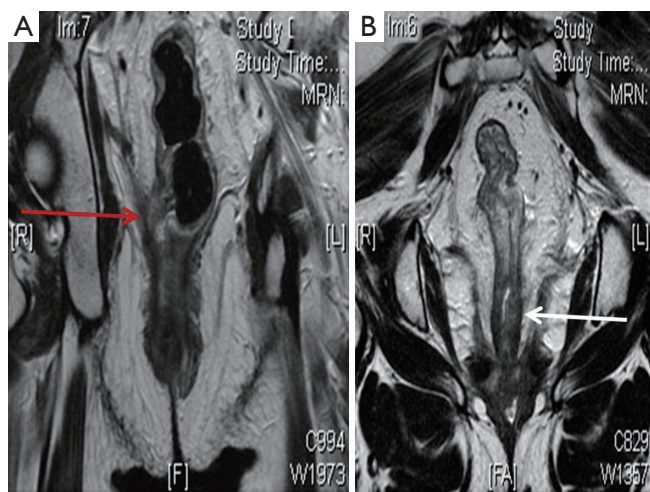
This is a retrospective review of a prospectively maintained database in the Division of Colorectal Surgery at the Tata Memorial Center, Mumbai, India. All patients undergoing

an APER between July 1, 2013, and January 31, 2015, were included in the study. A comparative analysis was performed between those who underwent conventional APER and ELAPER.

Following a detailed history and physical examination, all patients underwent a complete colonoscopy with biopsy and determination of serum carcinoembryonic antigen (CEA) levels. Local regional staging was achieved with a baseline magnetic resonance imaging (MRI) of the pelvis (MRI 1). Contrast-enhanced computed tomography (CECT) of the thorax and abdomen were performed to rule out metastatic disease. Neoadjuvant chemo radiotherapy (NACTRT) was administered to all patients with a threatened CRM and/or enlarged mesorectal nodes on preoperative MRI. All treatment decisions were taken by a multidisciplinary team (MDT), comprising a colorectal surgeon, a radiation oncologist, a gastroenterologist, and a radiologist. NACTRT consisted of 50 Gy in 25 fractions for 5 weeks along with concurrent oral capecitabine (850 mg/m<sup>2</sup> twice a day from days 1 to 14 and 22 to 35). Patients receiving NACTRT were evaluated for response with a second MRI of the pelvis (MRI 2) after 6–10 weeks of completion of neoadjuvant therapy, just before definitive surgery. The decision to perform ELAPER was individualized and was based mainly on the extent of levator muscle involvement, bulk of the tumor, the closeness of the tumor to CRM on MRI, and on the subjective judgment of the MDT (*Figure 1A,B*). Young male subjects with the involvement of prostate on MRI underwent either pelvic exenteration or ELAPER with shaving off the tumor from prostate depending on the extent of prostatic involvement and after discussion with the patient.

### *Technique of ELAPER*

After an initial exploration of abdomen and pelvis to ensure the absence of liver and peritoneal metastasis, the mesorectum is mobilized till the origin of levator muscle circumferentially. This roughly corresponds to the sacrococcygeal joint posteriorly, the ischial spines laterally, and the seminal vesicles anteriorly. The inferior mesenteric pedicle is divided, the end sigmoid stoma created, and the abdomen closed. The patient is then placed in prone position and an extended perineal dissection performed, which encompasses an en bloc resection of the sphincter complex and the levator muscles from their origin on the pelvic sidewall. The coccyx is removed in continuity with the main specimen to facilitate access and ensure a negative



**Figure 1** MRI of the pelvis, coronal view showing low rectal tumor (A) with levator infiltration, which merits ELAPER, and (B) without levator infiltration for which role of ELAPER not yet established.

**Table 1** Demographic data

Demographics	Conventional (n=78)	ELAPER (n=42)	P
Age (median), years	47	46	0.971
Sex			0.011
Male	53 (2:1)	37 (7:1)	
Female	25	5	
Levator involvement, n [%]			0
Involved	13 [17]	22 [52]	
Not involved	65 [83]	20 [48]	
NACTRT, n [%]			0.315
Yes	62 [79]	37 [88]	
No	16 [21]	5 [12]	
Type of surgery, n [%]			0.333
Open	44 [56]	26 [62]	
Laparoscopic	30 [39]	16 [38]	
Robotic	4 [5]	0	

ELAPER, extralevator abdominoperineal resection; NACTRT, neoadjuvant chemoradiotherapy.

CRM for posteriorly based tumors. Anteriorly, if the CRM is found to be threatened, a portion of prostate or vaginal wall is also removed. The resultant perineal defect is closed primarily in layers only if a tension-free closure is possible. Otherwise, some form of plastic reconstruction is adopted in the form of a V-Y advancement flap or gracilis flap with

or without biological mesh placement.

Short-term oncological parameters evaluated included CRM positivity, tumor site perforation, and number of nodes harvested. Peri operative outcomes included blood loss, length of hospital stay, postoperative perineal wound complications, and 30-day mortality. Statistical analysis was performed using SPSS software, version 18.0 (SPSS, Chicago, IL, USA). The  $\chi^2$ -test or Fisher's exact test, as appropriate, was used for univariate analysis.

## Results

There were 120 APERS performed between July 1, 2013, and January 31, 2015, and all were included in the analysis. There were 42 cases of ELAPER and 78 cases of conventional APER. The baseline patient characteristics are shown in *Table 1*. The two groups were comparable in all the parameters except levator involvement. Levator involvement was significantly higher in the ELAPER compared with conventional group ( $P=0.000$ ). ELAPER was offered to female patients less often than male subjects although it did not reach statistical significance. Among the 46 patients who underwent laparoscopic surgery in both the groups, there was no conversion to open surgery in any of the patients.

Clinical and oncological outcomes are shown in *Tables 2* and *3*, respectively. Although the median blood loss was higher, it did not reach statistical significance. Plastic reconstruction was required in significantly higher proportion of patients in the ELAPER group. Plastic reconstruction was in the form of V-Y advancement flap or gluteal flap in majority of the patients. Median hospital stay was significantly longer in ELAPER group compared with conventional group ( $P=0.024$ ). CRM involvement was seen in seven patients (8.9%) in the conventional group compared with three patients (7.14%) in the ELAPER group. Tumor site perforation was seen in three patients (3.84%) in both the conventional group and the ELAPER group (7.14%). Difference between the two groups in terms of CRM positivity and tumor site perforation did not reach statistical significance. Although perineal wound complications, including wound infection and wound dehiscence, were higher in the conventional group compared with ELAPER, the difference did not reach statistical significance. Two patients in each group required major flap reconstruction for the perineal wound dehiscence. There were no cases of perineal hernia in either group. Univariate analysis of the various factors (*Table 4*) contributing to CRM involvement was performed although none of them significantly influenced CRM involvement.

**Table 2** Comparison of clinical outcomes between conventional APER and ELAPER

Clinical outcome	Conventional (n=78), n [%]	ELAPER (n=42), n [%]	P
Blood loss (median), mL	400	500	0.412
Plastic reconstruction			0.032
No	75 [96]	35 [83]	
Yes	3 [4]	7 [17]	
Mesh placement			0.329
Yes	0	1 [2.4]	
No	0	41 [97.6]	
Wound complications			0.141
Yes	25 [32]	8 [19]	
No	53 [68]	34 [81]	
Hospital stay (median), days	8	9	0.024

APER, abdominoperineal resection; ELAPER, extralevator APER.

**Table 3** Comparison of short-term oncological outcomes between conventional APER and ELAPER

Oncological outcomes	Conventional (n=78), n [%]	ELAPER (n=42), n [%]	P
CRM involvement	7 [8.9]	3 [7.14]	1
Tumor site perforation			0.529
No	75 [96.16]	39 [92.86]	
Yes	3 [3.84]	3 [7.14]	
Nodes (median)	11	8	0.481
pT			0.798
No residual tumor	17 [22]	9 [21]	
T1	6 [8]	1 [3]	
T2	20 [25]	13 [31]	
T3	31 [40]	16 [38]	
T4	4 [5]	3 [7]	

APER, abdominoperineal resection; ELAPER, extralevator APER; CRM, circumferential resection margin; pT, pathological tumor stage.

## Discussion

APER is the standard of care for low rectal cancers for many years. Despite advances in the management of rectal cancers including routine local staging with MRI pelvis, NACTRT for locally advanced disease and total mesorectal

**Table 4** Univariate analysis of the CRM positivity

Patients characteristics	CRM positivity		P value
	n=120	CRM positivity	
Sex			0.478
Male	90	7	
Female	30	3	
Levator involvement			1
Involved	35	3	
No involved	85	7	
NACTRT			0.689
Yes	97	9	
No	21	1	
Minimally invasive vs. open			0.818
Open	70	7	
Laparoscopy	46	3	
Robotic	4	0	
Type of surgery			0.512
Conventional APER	78	7	
Extralevator APER	42	3	
pT group			0.064
pTx/1/2	66	1	
pT3/4	54	9	

CRM, circumferential resection margin; NACTRT, neoadjuvant chemoradiotherapy; APER, abdominoperineal resection; pT, pathological tumor stage.

excision, outcomes of APER have remained suboptimal when compared with anterior resection (6). These outcomes were reflected with high CRM involvement (49.6%) and intra operative perforation rates (28.2%) even in specialized centers. Holm *et al.* (11) advocated a prone approach with gluteus maximus flap for APER with good oncological outcomes. Following this, multi centric studies compared results of ELAPER against conventional APER and found good outcomes with ELAPER (18). The major drawback of majority of these studies was that it was a historical comparison. As a result, improved outcomes might have been accounted for by changes in staging and treatment strategies rather than the surgery itself. This theory is further strengthened by the fact that many of the well-known centers across the world have shown quite good results with conventional APER (19).

ELAPER is not widely practiced in India, with no case series published in English literature. With the inception of dedicated colorectal unit at our institute, ELAPER was



introduced for advanced tumors with either involvement of levators or proximity to prostate. ELAPER could not be offered to some patients owing to time constraints (as change of position leads to extra operative time) and concerns from the anesthesiologists.

In this study, despite higher proportion of patients with levator involvement (52% vs. 17% for ELAPER vs. conventional APER, respectively), ELAPER led to lower rates of CRM involvement compared with conventional APER in patients with low rectal cancer, although on univariate analysis, it did not reach statistical significance (Table 4). Rates of intra operative tumor site perforation were comparable between the two groups. Reported rates of CRM involvement and tumor site perforation in literature for APER are 11–52% and 10–19%, respectively. Those for ELAPER are 7–17% and 3.5–13%, respectively. Studies comparing these two surgical techniques are divided, with some of them clearly showing the superiority of ELAPER over APER for CRM involvement (13,15), whereas others having failed to demonstrate the same (12,20–22). Only one randomized trial did show significantly lower rates of local recurrence with ELAPER. But, it was a small study (n=67) and less than 30% of the patients received neoadjuvant treatment which is the standard of care at present (16). Owing to these issues, it cannot be considered as a robust evidence. Stelzner *et al.* (14) performed a systematic review of 1,097 patients comparing ELAPER with APER and found that rates of CRM involvement, tumor site perforation, and local recurrence were significantly lesser with ELAPER. In contrast, Krishna *et al.* (17) performed a similar review and questioned the role of ELAPER. In this study, the rates of CRM involvement were lower in both the groups compared with the reported series. This is the result of high volumes of rectal cancers at our center, standardization of the operative technique, and supervision of the perineal part of the surgeries by the two senior surgeons.

In this study, the need for flap reconstruction was higher with ELAPER compared with conventional, which is consistent with the literature APER (22). The rates of perineal wound complications were not significantly higher with ELAPER compared with conventional APER owing to better case selection with more liberal use of plastic reconstruction whenever tight primary closure was anticipated and expertise of plastic surgery team at our institute. Although the use of biological mesh in pelvic floor repair is advocated for reducing the incidence of perineal hernia, it was not used routinely as a result of higher cost

and difficulty in procurement (23).

ELAPER is being looked upon as a better way of performing APER for low rectal cancers. LOREC project looked at training radiologist, surgeons, and pathologists using the cadaver models (24). Extent of levator involvement is the single most important factor in deciding the approach. We compared two groups of patients and found higher CRM involvement in patients undergoing conventional APER. In spite of smaller comparison groups, fewer numbers of events in both the groups and a possible selection bias in this study, ELAPER appears to be oncologically superior for tumors involving levators. Only a well-conducted prospective randomized trial comparing ELAPER with conventional APER can solve this dilemma.

## Conclusions

ELAPER should be the preferred approach for low rectal tumors with involvement of levators. For those cases in which levators are not involved, as shown in preoperative MRI, the current evidence is insufficient to recommend ELAPER over conventional APER. This stresses the importance of preoperative MRI in determining the best approach for an individual patient. Time is right for a randomized trial comparing the results of ELAPER with conventional APER in this subgroup of patients.

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## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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