

Comparison of Extralevator Abdominoperineal Excision (ELAPE) and Abdominal - Perineal Resection (APR)

Xiao-Tang Zhao, Wan-Bin Yin, Yun Lu 

Abstract: To compare the difference between the extralevator abdominoperineal excision (ELAPE) and abdominal - perineal resection (APR) in circumferential resection margin (CRM) positive rate, intraoperative perforation (IOP), the incidence of postoperative wound infection, incision infection reoperation rate, surgical indications, operation time, hemorrhage volume, the recurrence rate, postoperative quality of life (perineal pain, urinary and reproductive function). By searching the literature about ELAPE and APR, reviewed their clinical value. ELAPE has greater advantages in reducing the CRM, IOP and the recurrence rate in patients with low colorectal cancer, lower hemorrhage volume than the APR, but surgical area larger defects appear perineal pain, increase the incidence of urinary and reproductive dysfunction, and longer operative time with respect to the APR. APR is the first choice for low colorectal cancer patient with cT1 ~ 2 or ycT0 ~ 2 period; after neoadjuvant chemoradiotherapy and tumor stage ycT3 ~ 4 stage patients ELAPE is more appropriate, ELAPE in postoperative complications, postoperative quality of life aspect is also worth to wait.

Keywords Extralevator abdominoperineal excision; Abdominal -perineal resection; Low colorectal cancer; Perineal reconstruction; Circumferential resection margin

The incidence of colorectal cancer in the world ranked third and surgical resection is the primary treatment. In patients with colorectal cancer incidence in China about 70.0% ~ 70.0% for low rectal cancer from anal edge (< 7 cm) below the peritoneal reflected. [1] Miles published an article entitled "A method of performing abdomino-perineal excision for carcinoma of the rectum and of the terminal portion of the pelvicolon," in the Lancet in 1908. He put forward a local colorectal cancer operation mode and it was called "en bloc" --APR surgical mode. [2] More than 100 years, the radical resection of rectal carcinoma had evolved evolution, improvement, and diligence from APR to total mesorectal excision (TME) to the pelvic

autonomic nerves preservation. [3] In 2007, Holm and put forward a new radical resection of rectal carcinoma - the extralevator abdominoperineal excision (ELAPE). [4] This paper will compare ELAPE surgery and APR surgery in the following areas: positive rate of circumferential resection margin (CRM), the rate of intraoperative perforation (IOP), the rate of postoperative wound infection, the rate of wound infection reoperation, indications for surgery, operation time, hemorrhage volume, recurrence rate, postoperative quality of life (perineal pain, urinary and reproductive function), and other aspects. And give a review.

This article is published under the terms of the Creative Commons Attribution License 4.0
Author(s) retain the copyright of this article. Publication rights with Alkhaer Publications.
Published at: <http://www.ijsciences.com/pub/issue/2016-03/>
DOI: 10.18483/ijSci.976; Online ISSN: 2305-3925; Print ISSN: 2410-4477



Yun Lu (Correspondence)

xtzhao89@126.com

1. Operative range

ELAPE is more precise than APR for the provisions of the resection range. The former operation range is an anatomy concept, the latter operation range is an ambiguous anatomy concept. It is a large variation when it is affected by the surgeon's surgical habits and other personal factors, it is difficult to develop an effective and universal standard. ELAPE summed up the operation range as "four borders" [5] and made it have a clear anatomical starting point and easy to learn and memory.

2. Operative position

In the perineum operation of ELAPE we often use prone jackknife position.

Advantages:

1, Operation area can be fully exposed in this position and giving the surgeon a good surgical vision. 2, The clearly surgical field makes the operation accurate and reduce the injury of nerve and blood vessel and increase cut rate. 3, It significantly reduces rate of IOP [9] 4, It increase cut rate where the tumor in the rear wall of the rectum. 5, Assistants observe operation easily, not only assist the surgeon but also study well.

Disadvantages:

We need changing position in this operation and waste time because of the change. 2, The patient's position would make the trachea and chest are under pressure and affect the anesthesia procedure. 3, After the completion of the surgery patients need to be restored, the process of changing positions and reset will increase the risk of injury patients.

Lithotomy position

Advantages:

1, In this operation needn't changing position and this can save operative time. 2, Surgeons are more familiar with this position. 3, It will not affect the anesthesia procedure.

Disadvantages:

1, The surgical field is not clear, hanging scrotum and penis can affect surgical vision for male and increase the risk of transmission. 2, Performer look up for a long time, it is easily to produce fatigue and accidentally injure the blood vessels and nerve. 3, Instruments used more in the operation, it is easily to cause unnecessary injury under the condition of the unclear surgical field.

Regardless of prone jackknife position or lithotomy position shall be on the premise of improve the radical.

3. The incidence of CRM, IOP and the recurrence rate

Most researches believe ELAPE can lower the positive rate of CRM and the rate of IOP. In theory, ELAPE can reduce the local recurrence rate and further improve survival rate. West NP and Anderin C and Smith KJ published a paper what the multicentre experience with ELAPE in 2010 [9]. There are 176 patients of postoperative of ELAPE in this study. Compared with traditional surgery ELAPE can significantly reduce the positive rate of CRM (20.3% vs. 49.6%, $P < 0.001$) and the rate of IOP (8.2% vs. 28.2%, $P < 0.001$). It confirmed that compared with the traditional APR, ELAPE can significantly increase the removed amount of rectal tissue around the tumor and avoid the "surgical waist" in APR operation, thus ELAPE can reduce the CRM positive rate and rate of IOP. The study conducted a case-control not only the group but also the individual doctors who were compared before and after application of ELAPE, both of them were confirmed the advantage of ELAPE. Zhenjun Wang research group [10] reported a single-center prospective randomized study in 2012, it confirmed the positive rate of CRM and the local recurrence rate (2.8% compared with 18.8%, $P = 0.048$) of ELAPE was significantly lower than the traditional APR. Beijing Chao-Yang Hospital Attached of Capital Medical University Beijing and seven general hospitals in China conducted a

prospective multicentric study of ELAPE[11]. There are 102 patients of postoperative of ELAPE in this study. The median intraoperative blood loss was 200mL. There are 6 cases with positive of CRM (5.9 %), there are 4 cases with IOP(3.9%), local recurrence rate was 4.9%. Whether single-center or multicentric study confirmed ELAPE has a lower rate of IOP and positive rate of CRM and local recurrence rate than traditional APR.

4. Operative time and blood loss volume

ELAPE needs changing position, while APR surgery without changing position, ELAPE and APR have a roughly the same time during the surgery of abdominal and perineal region, therefore the operative time of ELAPE was significantly longer than the APR. The surgical field of ELAPE more in the gap between advances, the gap between relatively small amount of bleeding. The surgical fields of ELAPE between the gap and less hemorrhage volume between the gap.

5. Postoperative quality of life

Angete et al [12] compared clinical data from 2004 to 2009, it contains 31 cases of traditional APR and 38 cases ELAPE. During a mean follow-up of 44 months, stoma necrosis were more common for ELAPE (34% VS10%), but it is common that stoma bandaging problem and low stoma height for traditional APR. The patients were followed up for one year, two groups have no significant difference of stoma function. Welsch et al [13] retrospectively analyzed 30 patients from 2007 to 2011 and accept ELAPE, it is the similar for traditional APR at the quality of life score and they think that the ELAPE did not reduce the overall quality of life scores. But ELAPE have a higher incidence of complication of perineal especially the perineal pain (50%) and affect the postoperative urinary reproductive function. It is pointed out that it need to improve the technology in order to reduce complications. Vaughan-Shaw et al. [14] compared APR and ELAPE in the quality of life, it

includes 16 cases of ELAPE and 20 cases of APR and evaluate the quality of life of the patients who after two weeks surgery use EORTC、QLQ-C30 and QLQ-C29 questionnaires. They found that it is no significant difference in the quality of life and short-term prognosis of the two groups of patients. From the current study, the overall quality of life in patients after ELAPE has no significant difference with the traditional APR, but the incidence of postoperative perineal chronic pain may increase.

ELAPE surgery removes more tissue around the rectum, forming a huge defect of pelvic floor. It may increase the chance of pelvic and perineal nerve damage, especially the pelvic plexus, the pudendal nerve, the penis / clitoris dorsal nerve and the pelvic neurovascular bundle and it may increase the incidence of postoperative complications what the sexual dysfunction and urinary retention.[15] Recent European multi-center study point out that in addition to the perineal wound complications and the pelvic complications of ELAPE is two times that of traditional APR, mainly composed of sexual function and urination disorders.[16] The laparoscopic ELAPE study also found that after the QLQ-CR29 questionnaire survey, male patients have significant erectile dysfunction (average 75 points), they comprehensive analysis of all patients and found that the frequency of urination has a moderately increase (average 37.5 points).[17]

6. Surgical wound infection and surgical incision reoperation rate

In 2012 a single-center retrospective study in Sweden compared two cases of ELAPE and APR in quality of resection specimens and postoperative complications.[18] The two groups were comparable in operative indications and the TNM stage of preoperative. The study shows that ELAPE and APR have no statistical significance in the positive rate of CRM (17% vs.20%) and the rate of IOP(13% vs.10%)

and other quality evaluation index of surgical specimen, more importantly, the local recurrence rate were not significantly different (9% vs.9%) between the two groups. However, ELAPE group has significantly increase in the incidence of complications and the infection rate of perineal wound (46% vs.28%) and the rates of reoperation (22% vs.8%). Therefore, the study shows that both the quality of operative specimens or the postoperative recurrence rate, ELAPE didn't get a better oncological effect than the APR. Therefore, it is too early to assert that ELAPE replace APR in clinical practice. At the end of 2013, Ramsay published a paper named "Analysis of outcome using alevator sparing technique of abdominoperineal excision of rectum and anus. Cylindrical ELAPE is not necessary in all patients" in EJSO magazine. In this paper he obtained an encouraging result about "Preoperative neoadjuvant chemotherapy + APR" for the treatment of colorectal cancer.[19] Although 16.3% of surgical specimens of APR are positive of CRM, however, only 4.6 percent of patients had local recurrence in the median of 38 months of follow-up period. Based on these findings, the researchers believe that it is also the security and effective treatments for low rectal cancer what the APR of retaining the levator anal and give a fully neoadjuvant chemotherapy. The perioperative complication rate of APR was significantly lower than ELAPE, ELAPE can not replace the APR and apply to all low rectal cancer patients who can not keep anal.

7. The indications of ELAPE and APR

In 2014, professor Hplm's team is the earliest team which introduced the ELAPE. The team reported 193 cases cT1 ~ 4 stage colorectal cancer patients who received "neoadjuvant (chemotherapy) radiotherapy + ELAPE" treatment, the result is satisfied [20]: the positive rate of CRM was 20%, IOP rate was 10%. after a median of 31 (0 to 156) months of follow-up, only six percent of the patients local recurrence; 5-year overall survival and survival of cancer-specific was 60%

and 67%. Although the authors stress that ELAPE indication of cT3 ~ 4 stage patients are based on the preoperative evaluation of MRI. However, postoperative histopathologic displayed the patients of pT1 ~ 2, pT3, pT4 stage were 36%, 44%, 20%.[3] In 2010, European scholars initiated a retrospective study of multi-center [21], the purpose is to compare the surgical specimen quality and the short-term efficacy of surgery between ELAPE and APR. The results show that, ELAPE removed more tissue outside of rectal than APR, the positive rate of CRM was significantly lower (49.6% vs.20.3%, $P < 0.001$), IOP was significantly lower (28.2% vs.8.2%, $P < 0.001$). Correlation analysis also showed that, the positive rate of CRM and IOP rate are associated with the choice of the type of surgery (ELAPE and APR), however, it is associated with the depth of invasion of the tumor (T3 ~ 4) too. The findings is exciting what ELAPE can significantly reduce IOP rate and CRM positive rate, and it can be expected ELAPE should reduce the local recurrence rate. However, the results of the study show ELAPE only able to reduce the incidence of CRM positive rate and IOP rate of low colorectal cancer at the stage of T3 ~ 4 and for patients pT0 ~ 2 stage it can increased the incidence of perineal incision. Some scholars have question of the surgical indication of the study that it included the 37.5 percent of patients of pT0 ~ 2 stage[22], the conclusion to "ELAPE can reduce the CRM positive rate and IOP rate for low colorectal cancer at the stage of T3~4" is more rigorous.

8. Summary

ELAPE adopts prone jackknife position makes the anatomic landmarks clear, operational level clear, it in line with the development trend of clinical subtle anatomy of surgery, help protect the pelvic nerve, protect sexual function, improve quality of life, it is possible to reduce bleeding, it will help shorten the learning curve. ELAPE has a more clearly operative plane than APR at the perineum part, namely the sphincter ani externus - levator ani plane, rather than

emphasize remove enough perianal skin and fat of ischio-rectal fossa. Removed excess fat of ischio-rectal fossa, it does not change the prognosis of colorectal cancer patients, but increased the incidence of perineal wound complications. Perineal of ELAPE has a widely excision and lend a higher incidence of postoperative perineal wound complications. Postoperative patients with limitation of activity in a certain time, after the use of artificial materials or skin flap repair the defect of pelvic floor, so it has not been widely accepted and developed. But this concept is widely accepted what ELAPE can reduce the recurrence rate of low colorectal cancer. We will have a better operative field after the coccyx has been removed, if the tumor is located in the posterior wall of the rectum, we suggest that remove the coccyx. ELAPE is better than traditional APR in reduced the CRM positive rate and IOP rate for patients at the stage of T3 ~ 4 in low colorectal cancer. ELAPE and traditional APR have no significant difference for patients at the stage of T1 ~ 2 in Low colorectal cancer, but the postoperative complications of ELAPE are more than traditional APR, patients for this period, the surgical benefit rate of traditional APR is higher than ELAPE. ELAPE and APR have advantages and disadvantages, choose the appropriate stage and give patients different treatment methods in order to improve the operation benefit rate.

References

- [1] Yu BM . The status and prospects of surgical treatment of colorectal cancer [J] Chinese Journal of Bases and Clinics in General Surgery, 2008, 15(9):631-636.
- [2] Miles WE. A method of performing abdomino-perineal excision for carcinoma of the rectum and of the terminal portion of the pelvicolon (1908). CA Cancer J Clin, 1971, 21(6): 361-364.
- [3] Yao HW, Li WD, Liu YH. Further discussion of necessity and indications of the treatment with extralevator abdominoperineal excision [J] Chinese Journal of Practical Surgery. 2014, 34(9) : 804-807
- [4] Holm T, Ljung A, Häggmark T, et al. Extended abdominoperineal resection with gluteus maximus flap reconstruction of the pelvic floor for rectal cancer [J] . Br J Surg, 2007, 94(2): 232-238.
- [5] Ye YJ, Shen ZL, Wang S. The key anatomic and the “two plants and four borders” principle of extralevator abdominoperineal excision. Chinese journal of gastrointestinal surgery. 2014,17(11): 1076-1080. DOI:10. 3760/cma.j.issn. 1671-0274.
- [6] West NP, Anderin C, Smith KJ, et al . Multicentre experience with extralevator abdominoperineal excision for low rectal cancer [J] . Br J Surg , 2010,97(4) : 588-599.
- [7] Han JG, Wang ZJ, Gao ZG, et al. Pelvic floor reconstruction using human acellular dermal matrix after cylindrical abdominoperineal resection [J] . Dis Colon Rectum, 2010, 53(2): 219-223.
- [8] Wang ZJ, Qian Q, Dai Y et al. An prospective multicenter study of low and advanced rectal cancer in extralevator abdominoperineal excision [J]. Chinese journal of surgery, 2014, 52(1): 11-15.
- [9] Angenete E, Correa-Marinez A, Heath J, et al. Ostomy function after abdominoperineal resection — a clinical and patient evaluation [J] . Int J Colorectal Dis, 2012, 27(10): 1267-1274.
- [13] Welsch T, Mategakis V, Contin P, et al. Results of extralevator abdominoperineal resection for low rectal cancer including quality of life and long-term wound complications [J]. Int J Colorectal Dis, 2013, 28(4): 503-510.
- [10] Vaughan-Shaw PG, Cheung T, Knight JS, et al. A prospective case-control study of extralevator abdominoperineal excision (ELAPE) of the rectum versus conventional laparoscopic and open abdominoperineal excision: comparative analysis of short-term outcomes and quality of life [J] . Tech Coloproctol, 2012, 16(5): 355-362.
- [11] West NP, Anderin C, Smith KJ, et al . Multicentre experience with extralevator abdominoperineal excision for low rectal cancer [J] . Br J Surg, 2010,97(4) : 588-599.
- [12] Stelzner S, Holm T, Moran BJ, et al . Deep pelvic anatomy revisited for a description of crucial steps in extralevator abdominoperineal excision for rectal cancer [J] . Dis Colon Rectum , 2011, 54(8) : 947-957.
- [13] Asplund D, Haglund E, Angenete E. Outcome of extralevator Abdominoperineal excision compared with standard surgery: Results from a single centre [J] . Colorectal Dis, 2012, 14(3) : 1191-1196.

- [14] Asplund D, Haglind E, Angenete E. Outcome of extra-levator abdominoperineal excision compared with standard surgery: Results from a single centre [J]. *Colorectal Dis*, 2012, 14(3): 1191-1196.
- [15] Ramsay G, Parnaby C, Mackay C, et al. Analysis of outcome using a levator sparing technique of abdominoperineal excision of rectum and anus. Cylindrical ELAPE is not necessary in all patients [J]. *Eur J Surg Oncol*, 2013, 39(11): 1219-1224.
- [16] Palmer G, Anderin C, Martling A, et al. Local control and survival after Extra-Levator Abdomino-Perineal Excision (ELAPE) for locally advanced or low rectal cancer [J]. *Colorectal Dis*. 2014 Mar 7. doi: 10.1111/codi.12610.
- [17] Anderin C, Martling A, Lagergren J, et al. Short-term outcome after gluteus maximus myocutaneous flap reconstruction of the pelvic floor following extra-levator abdominoperineal excision of the rectum [J]. *Colorectal Dis*, 2012, 14(9): 1060-1064.
- [18] Yao HW, Liu YH. Discussion on hot issue and evolution about the operation mode in the low rectal cancer. [J] *Chinese journal of surgery*. 2013, 51(2): 104-107.