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REVIEW ARTICLE

Efficacy and safety of ultralow anterior resection towards low-lying rectal cancer: A literature review

Eficacia y seguridad de la resección anterior ultrabaja para el cáncer de recto bajo: Una revisión de la literatura

Wildan A. Wilkensia, MD[1], Arif Zuhan, MD[2]

1 Surgical Resident Program, Faculty of Medicine Universitas Mataram, General Hospital of NTB Province, Indonesia.
2 Division of Digestive Surgery, Department of Surgery, Faculty of Medicine Universitas Mataram, General Hospital of NTB Province, Indonesia.

Abstract

Introduction. Ultralow anterior resection (ULAR) is a modality used to treat low-lying rectal cancer. However, its efficacy and safety profile have yet to be clearly established. This literature review aimed to determine the efficacy and safety profile of ULAR for low-lying rectal cancer.

Methods. A narrative literature review was performed using PubMed, Scopus, and Web of Science to identify English-language studies assessing ultralow anterior resection (ULAR) in adult patients with low-lying rectal cancer. Eligible studies reported oncological and/or functional outcomes, while non-surgical studies or those lacking outcome data were excluded.

Results. There was no difference in Wexner scores between groups. Incontinence was highly associated with the intersphincteric resection (ISR) group, while there was no difference in overall survival or disease-free survival between groups (91.4% vs. 91.7% and 79% vs. 79.2%, respectively; p>0.05). However, there was a higher rate of postoperative morbidity in the ULAR group, which is commonly manifested as postoperative anastomotic leakage.

Conclusion. Therefore, ULAR showed no inferiority compared with other techniques, along with preservation of the sphincter; however, proper postoperative surveillance was required.

Keywords: efficacy; rectal cancer; safety; anterior resection; ultralow.

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Corresponding author: Wildan A. Wilkensia, MD. Jl. Prabu Rangkasari, Dasan Cermen, Kec. Sandubaya, Kota, Mataram, Postal Code 84371, Nusa Tenggara Barat Province, Indonesia. Tel.: +62 813-8896-3924. E-mail: wildan.acalipha15@gmail.com
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Resumen

Introducción. La resección anterior ultrabaja (ULAR) es una modalidad utilizada para tratar el cáncer de recto bajo. Sin embargo, su eficacia y perfil de seguridad aún no se han establecido con claridad. Esta revisión bibliográfica tuvo como objetivo determinar la eficacia y el perfil de seguridad de la ULAR para el cáncer de recto bajo.

Métodos. Se realizó una revisión bibliográfica narrativa utilizando PubMed, Scopus y Web of Science para identificar estudios en inglés que evaluaran la resección anterior ultrabaja (ULAR) en pacientes adultos con cáncer de recto bajo. Los estudios elegibles comunicaban resultados oncológicos y/o funcionales, mientras que se excluyeron los estudios no quirúrgicos o aquellos que carecían de datos sobre los resultados.

Resultados. No hubo diferencias en las puntuaciones de Wexner entre los grupos. La incontinencia se asoció fuertemente con el grupo de resección interesfinteriana (ISR), mientras que no hubo diferencias en la supervivencia global ni en la supervivencia libre de enfermedad entre los grupos (91,4 % frente a 91,7 % y 79 % frente a 79,2 %, respectivamente; p>0,05). No obstante, se observó una mayor tasa de morbilidad posoperatoria en el grupo ULAR, manifestada comúnmente como fuga anastomótica posoperatoria.

Conclusión. Por consiguiente, la ULAR no mostró inferioridad frente a otras técnicas y permitió la preservación del esfínter; sin embargo, requirió una vigilancia posoperatoria adecuada.

Palabras clave: eficacia; cáncer de recto; seguridad; resección anterior; ultrabajo.

Introduction

Low-lying rectal cancer refers to rectal malignancies located close to the anal verge; however, its definition varies across studies. Some authors define low-lying rectal cancer as tumors located less than 6 cm from the anal verge, whereas others use a cut-off of 5 cm [1-3]. Despite these differences, low-lying rectal cancer represents a clinically important subgroup, accounting for approximately 30% of rectal cancer cases.

Colorectal cancer is one of the most commonly diagnosed malignancies worldwide. In the United States alone, more than 135,000 new cases of colorectal cancer are reported annually. The disease increasingly affects younger adults and populations from lower socioeconomic backgrounds [4]. Although colorectal cancer, including low-lying rectal cancer, is often diagnosed at an advanced stage (Stage III), appropriate and timely management is associated with favorable outcomes, with reported 5-year survival rates of approximately 65% among treated patients [5-6]

Management strategies for low-lying rectal cancer have evolved substantially, driven by advances in surgical techniques and a growing emphasis on sphincter preservation and quality of life. Conventional approaches such as abdominoperineal resection (APR) and low anterior resection (LAR) remain widely used [7-9]. While APR offers good oncological control, it is associated with permanent colostomy, reduced quality of life, higher healthcare costs, and increased risks of perineal wound complications [10,11]. Consequently, sphincter-preserving procedures have gained increasing attention.

Methods

This manuscript was designed as a narrative literature review focusing on the efficacy and safety of ultralow anterior resection (ULAR) in the management of low-lying rectal cancer. A structured literature search was conducted in major electronic databases, including PubMed, Scopus, and Web of Science, to identify relevant studies published in English.

Search terms included combinations of keywords such as “low-lying rectal cancer,” “ultralow anterior resection,” “sphincter-preserving surgery,” “oncological outcomes,” and “functional outcomes.” Original studies, comparative studies, and systematic reviews evaluating ULAR in adult patients with low-lying rectal cancer were

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considered eligible. Articles focusing exclusively on non-surgical management or lacking outcome data were excluded.

ULAR in the Management of Low-Lying Rectal Cancer

ULAR is a surgical technique for rectal cancer that spares the sphincter complex compared with other surgical techniques [3]. ULAR involves the complete removal of the rectum and mesorectum, which is known as total proctectomy. ULAR differs somewhat from LAR. LAR is performed for tumors located in the lower third of the rectum, commonly more than five centimeters from the dentate line, whereas ULAR is performed with a smaller margin, commonly within two centimeters above the dentate line.

ULAR is a newer approach that was developed from LAR to provide greater benefits for patients with low-lying rectal cancer. A study by Cheong et al. [12], which was conducted among 203 patients, found that ULAR provided significantly greater improvement in fecal incontinence compared with LAR ($p=0.045$). However, LAR symptoms were significantly improved only in the long term in the LAR group, not in the ULAR group. ULAR has also been compared with intersphincteric resection (ISR) in another study [13]. The study showed significantly lower median Wexner scores (5 vs. 8; $p=0.006$) and a lower rate of major incontinence (5.6% vs. 33.0%; $p<0.05$), but no significant difference in LAR scores ($p=0.293$). However, the study stated that there were significantly less stool fragmentation, nocturnal defecation, and administration of antidiarrheal medication in the ULAR group compared with the ISR group.

Contrasting results between ULAR and other modalities have highlighted a knowledge gap that warrants further thorough review. This literature review aimed to provide knowledge on the efficacy and safety of ULAR compared with other modalities in the management of low-lying rectal cancer. The knowledge gained was expected to help clinicians provide better management for the populations reviewed in this study.

ULAR involves *en bloc* rectal removal proximal to the puborectal site [14]. Therefore, ULAR is commonly conducted among patients with T3N0 rectal cancers within five centimeters of the dentate line or with any T1N1 or T2N1 tumors. Other requirements for ULAR to be conducted properly include negative vascular invasion outside the rectal wall, a negative circumferential margin predicted by magnetic resonance imaging (MRI), and extramural spread of less than five millimeters [15,16].

The technique determines pelvic floor and levator muscle exposure as the distal part of total mesorectal excision (TME) [17]. The approach in ULAR preserves the neurovascular bundle, which is external to the junction of Denonvilliers fascia (DVF) and the visceral fascia. The middle rectal artery (MRA) is identified if present. The procedure starts from the lateral side of the DVF and detaches it from the mesorectal fascia [18]. The dissection progresses toward the deep pelvic floor, thereby creating a gap between the pelvic floor and mesorectal fascia. The lateral ligament of the rectum (LLR) is left hanging with the upper soft connective tissue, serving as a bridge connecting the parietal fascia and mesorectal fascia and making dissection possible. The steps continue with MRA ligation alongside preservation of the pelvic plexus in the parietal wall [3].

ULAR involves rectal transection following one to two centimeters of complete mobilization distal to the tumor margin using a linear endostapler through a double-stapled anastomosis (DST). The perianal stage is performed for low-lying tumors located one to two centimeters from the dentate line. The perianal stage involves exposure of the anal canal using self-retaining retractors, followed by identification of the lower margin of the tumor by visualization. Transection of the rectum is conducted two centimeters distal to the tumor margin [19,20]. Dissection and mobilization of the rectum are continued along the anterior and lateral walls, followed by closure of the cut edge using interrupted sutures to prevent the spread of cancer cells. The specimen is extracted and drawn to the dentate line without creating tension and subsequently opened. End-to-end

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coloanal anastomosis (CAA) is performed above the sphincter complex, if possible [20]. Hand-sewn CAA is performed using a curved taper-point needle, size 4-0, together with absorbable thread, creating a layered anastomosis. Finally, closure is performed after placement of pelvic suction. A temporary diverting loop ileostomy due to the surgery is maintained for eight to twelve weeks postoperatively.

Efficacy and Safety of ULAR in the Management of Low-Lying Rectal Cancer

ULAR has demonstrated a good efficacy and safety over time, based on findings from numerous studies. It was reported that ULAR performed within two centimeters of the circumferential resection margin (CRM) provided no inferiority in recurrence and survival compared with APR [21]. Therefore, ULAR without preceding neoadjuvant treatment could be considered in patients with T1-2/N1 or T3N0 rectal cancer without metastasis or CRM involvement [22]. However, it should be noted that distant metastasis could occur through circulation and venous drainage to the vena cava, thereby bypassing the liver. The most common site of distant metastasis was the lung [23-25].

Functional outcomes differ between subjects. However, almost 90% of subjects developed low anterior resection syndrome (LARS). LARS was variable and included urgency, fecal incontinence, bowel movement disorders, fragmentation, and incomplete emptying. LARS following ULAR was best explained by impairment of anal sphincter and neorectal motility due to surgery. Pelvic dissection also caused nerve impairment, which could result in defecation disorders [26]. Therefore, several innovations have been developed to improve post-ULAR functional outcomes. However, the results have been controversial. A study showed that the use of a colonic J-pouch (CJP) resulted in no significant functional differences compared with the conventional technique [27]. Another study [28] using Baker-type anastomosis demonstrated no increase in postsurgical complications while achieving similar bowel function compared with CJP anastomosis. A meta-analysis [29] showed that the Baker type resulted in a shorter surgical duration and higher defecation frequency, while showing no differences in postsurgical complications or outcomes. Sexual dysfunction was also a concern, according to a Dutch study [26], which stated that 62 to 72% of subjects experienced sexual dysfunction, while more than 30% experienced voiding dysfunction.

Postoperative complications were quite common. Anastomotic leakage occurred in 1.3 to 8.1% of subjects, with a lower prevalence found in partial mesorectal excision compared with excision requiring TME [30,31]. Postoperative complications were highly related to tumor size of four centimeters or greater [32]. Another study found that late complications may still occur, such as fistula, chronic sinus, and stenosis, which could be found in 29.2 to 39.7% of subjects. Some complications were complex, thereby increasing the need for reoperation by a colorectal surgeon.

Comparison of ULAR as a Modality Option for Low-Lying Rectal Cancer

ULAR has proven non-inferior compared with other surgical methods in recent years. A study by Cheong et al. [12] showed that patients who underwent ULAR and LAR had better fecal incontinence Wexner scores (14.4 vs. 7.2; p=0.045, compared with 13.9 vs. 5.4; p<0.05). However, the same study noted that patients who underwent LAR had better LARS scores compared with patients who underwent ULAR (26.5 vs. 19.7; p=0.045, compared with 33.6 vs. 26.0; p=0.10). A study by Sakr et al. [33] compared ULAR with ISR. The study showed that there was a higher rate of fecal incontinence in the ISR group compared with the ULAR group (75.9% vs. 49.3%; p=0.016). There was no difference in Wexner scores between the groups. Incontinence was highly related to the ISR group, while there was no difference in overall survival or disease-free survival between the groups (91.4% vs. 91.7% and 79% vs. 79.2%, respectively; p>0.05).

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It was reported in several studies that ULAR resulted in more postsurgical morbidity compared with other procedures for low-lying rectal carcinoma. Postsurgical leakage was the most common complication reported, with a prevalence of between 3 and 20% [34,35]. However, anastomotic leakage was related to the type of anastomosis used. A shorter distance between the anastomosis and the anal verge increased the risk of postsurgical breakdown and leakage [36]. Some reports defined a distance of less than six centimeters as a predictor of postsurgical leakage [35,36]. Hand-sewn anastomosis was associated with better postsurgical outcomes [36]. In addition, radiotherapy was associated with postsurgical anastomotic leakage and, therefore, should be administered appropriately [37]. Therefore, routine follow-up should be conducted to ensure good postoperative outcomes after ULAR in patients with low-lying rectal cancer.

Conclusion

ULAR has good postoperative outcomes, with no inferiority compared with other modalities for the management of low-lying rectal cancer. However, ULAR is associated with several postoperative morbidities, which most commonly manifest as mild complications. Therefore, routine and appropriate postoperative surveillance should be implemented to improve patient outcomes.

Compliance with ethical standards

Informed consent: This study is a literature review, and as such, there is no need for informed consent or Institutional Ethics Committee approval.

Conflicts of interest: The authors declared that they have no conflicts of interest.

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- Study design and conception: Wildan A. Wilkensia, Arif Zuhan.
- Data acquisition: Wildan A. Wilkensia, Arif Zuhan.
- Data analysis and interpretation: Wildan A. Wilkensia, Arif Zuhan.
- Manuscript drafting: Wildan A. Wilkensia, Arif Zuhan.
- Critical review and final approval: Wildan A. Wilkensia, Arif Zuhan.

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