Review Article

Preventing Iatrogenic Ureteral Injury during Laparoscopic Left Colectomy

Prevenção de Lesão Iatrogénica do Ureter durante Colectomia Esquerda Laparoscópica

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ABSTRACT

The object of this review is to make a retrospective study about the incidence, the diagnosis, the timing of repair and the techniques of repair after iatrogenic ureteral injury during laparoscopic colectomy (IUILC).

A retrospective PubMed, Embase and Google Scholar database research from January 2000 to January 2020 was conducted enrolling studies about patients with iatrogenic ureteral injury during laparoscopic left colectomy (IUILC).

Diverticular disease seems to be the second most common diagnosis associated with IUILLC for the presence of intraoperative adhesions, while, for rectal cancer, preoperative chemoradiotherapy increases the risk of IUILLC. Ureteral catheter placement is not risk-free they may. Still, it helps the surgeons in immediate recognition and treatment of IUI at the time of surgery, diminishing morbidity and renal failure compared with cases where the diagnosis was delayed.

This retrospective review showed that increased surgeon awareness and meticulous technique may help reduce the incidence of IUILC.

Keywords: Colectomy/adverse effects; Iatrogenic Disease; Intraoperative Complications; Laparoscopy/adverse effects; Ureter/injuries

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RESUMO

O objetivo desta revisão é fazer um estudo retrospetivo sobre a incidência, o diagnóstico, o momento da reparação e as técnicas de reparação após lesão ureteral iatrogénica durante a colectomia laparoscópica (IUILC).
Foi realizada uma pesquisa retrospetiva nas bases de dados PubMed, Embase e Google Scholar de janeiro de 2000 a janeiro de 2020, envolvendo estudos sobre doentes com lesão ureteral iatrogénica durante colectomia esquerda laparoscópica (IUILC).
A doença diverticular parece ser o segundo diagnóstico mais comum associado ao IUILLC pela presença de aderências intraoperatórias, enquanto que, para o cancro do reto, a quimiorradioterapia pré-operatória aumenta o risco de IUILLC. A colocação do cateter ureteral não está isenta de riscos. Ainda assim, ajuda os cirurgiões no reconhecimento e tratamento imediato da IIU no momento da cirurgia, diminuindo a morbilidade e a insuficiência renal em comparação com os casos em que o diagnóstico foi tardio.
Esta revisão retrospetiva revelou que o aumento da sensibilização do cirurgião e uma técnica meticulosa podem ajudar a reduzir a incidência de IUILC.

Palavras-chave: Colectomia/efeitos adversos; Complicações Intraoperatórias; Doença Iatrogénica; Laparoscopia/efeitos adversos; Ureter/lesões

INTRODUCTION

The iatrogenic lesions of the ureter are a rare but serious complication in colic resections and in particular, in laparoscopic resections of the left colon (IUILC). They increase the duration of the operation and predispose the patient to an increased risk of postoperative morbidity and increased hospitalization. IUILC has an incidence from 0.2% to 6%-7%.[1] Other series have a documented incidence of 0.3% to 1.5%.[2-6] More than 80% of cases go unnoticed during the operation.[1,7,8] Colorectal operations are the second most common cause of IUILC, after gynecologic procedures[9,10] with a reported incidence of 0.24% to 1.95%. Some studies documented that colonic inflammatory diseases, such as complicated diverticulitis, malignant neoplasms, previous radiation therapy or previous operation, and resection of large pelvic masses, represented risk factors for ureteral injury.[11-13] Essential anatomical planes and structures might be recognized using anatomical knowledge.[14] Lights stents have been adopted in laparoscopic colorectal surgery (CRS) to improve the vision of the ureter and overcome the limits of tactile feedback.[15] The use of near-infrared fluorescence (NIRF) and methylene blue (MB) to see the ureter intraoperatively is a promising approach for simpler and maybe early imaging.[14] Assimos *et al*[16] evaluated the frequency of iatrogenic ureteral injuries in the prelaparoscopic and laparoscopic eras, finding that the latter had a much higher rate of ureteral injuries. To date, there have been no large-scale studies examining the incidence of IUILC in colorectal surgery.

METHODS

We have reflectively assessed PubMed, Embase and Google Scholar databases. Investigations were evaluated from 2000 to 2020. Consideration standards: English language, complete treatment of pathology from determination to medical procedure and catchphrases "Iatrogenic Left Ureteral Injury, Left colectomy, Laparoscopy" was inquired about. Rejection rules: not English language, case reports, fragmented conversation on pathology, manuscript below year 2000. Following these rules, we chose only database review original copies. Two surgeons (DC and SL) revised manuscripts. The object of this review study is to conduct a retrospective review of the incidence, the diagnosis, the timing of repair and the techniques of repair after iatrogenic ureteral injury during laparoscopic left colectomy (IUILC).

RESULTS

Palaniappa *et al*[7] conducted a prospective study to compare IUI during laparoscopic and open left colectomy. On a total of 5729 colectomies, they reported only fourteen ureteral injuries, resulting in a 0.244% incidence of iatrogenic ureteral injury. A Survival from the United States by Wissam[17] from 2001 to 2010 estimated 2 165 848 colon and rectal surgical procedures performed in the United States with IUILC occurred in 6027 cases (0.28%). IUILC occurred at higher rates in teaching as compared with nonteaching hospitals (3.4/1000 *vs* 2.3/1000; $p < 0.001$) and urban as compared with rural hospitals (2.8/1000 *vs* 2.3/1000; $p < 0.05$), higher rates of ureteral injuries in large compared with small hospitals (2.8/1000 *vs* 2.3/1000; $p < 0.05$); rectal cancer was associated with the highest rates of ureteral injuries (7.1/1000) followed by diverticular disease (2.9/1000), whereas benign colonic polyps had the lowest rates (0.9/1000). There were no differences in IUI rates between laparoscopic and open procedures (2.5/1000 *vs* 2.8/1000; $p = 0.14$), while left-sided procedures, anterior resections and abdominoperineal resections had the highest rates of IUI,

such as the presence of intraoperative adhesions. A study by Halabi *et al*[17] found an incidence of 0.28% of IUILC. Making a review of the Danish National Colorectal Cancer database (DCCG) with 18 474 patients following resection for colorectal cancer, Andersen *et al,*[18] showed an incidence of IUILC of 0.44% in all patients, with 37 (0.59%) injuries in the laparoscopic (n = 6291) and 45 (0.37%) in the open group (n = 12 183) (p = 0.03). A retrospective study from Mount Sinai Medical Center on 5729 colectomies demonstrated a significant incidence of iatrogenic ureteral injuries with laparoscopy compared with open colectomies and stated that preoperative stent placement did not ensure intraoperative identification of injury. Boyan Jr *et al,*[15] in a retrospective study on 402 laparoscopic colon resections performed using the lighting ureteral stent to avoid harm during dissection and resection, demonstrated that there were no ureter injuries and no catheter-related UTIs found. They found 3.5% of the patients had postoperative urine retention. Mahdi Al-Taher *et al*[16] used MB, to determine the feasibility of ureter NIRF imaging during laparoscopic colorectal surgery in 10 patients but when it comes to identifying the ureter during laparoscopic colorectal surgery, it has no practical benefit over standard laparoscopic imaging. Douissard et al[19] performed a survey study where surgeons tried to identify the left ureter more than the right one (83.7% vs 31.7%, respectively). Only 13.6% thought right ureter identification was required, whereas 77% thought left ureter identification was needed. IUI was shown to be more common among surgeons with more than 20 years of experience, with 78.4% of those. The majority of surgeons (93.5%) believed that ureteral stenting was effective in difficult operations. Fluorescence has been used in 54.5% of cases to prevent IUILLC.

DISCUSSION

Ureteral injuries are associated with higher post-operative morbidity, mortality, and increased hospital length of stay. They are a rare but serious complication. Previous radiation therapy or previous operation or diverticulitis increases the risk. Some authors advocated a repetitive method of resection to perform the same operating times for each intervention. Others have identified necessary landmarks that must be recognized to avoid IUILC. Still, other studies support the thesis that the use of ureteral stents or even better, luminous ureteral stents, while not greatly decreasing the incidence of IUILC, facilitates the surgeon in the dissection and identification of any damage to the ureters. There are recommendations to avoid or decrease IUILLC: a) know the anatomy of the ureter course; b) always identify it both in the mid-lateral and latero-medial dissection; c) view the ureter before the IMA section ; d) reconstruct the normal anatomy in case of inflammatory processes such as diverticulitis or Crohn or previous radiation or fibrosis; e) use ureteral stents if resection surgery is expected to be difficult; f) use luminous stents helps in following the course of the ureter; g) correct dissection of the Jonnesco region often the site of IUILC; h) the use of gauze to signal the pre-peritoneal space along the told fascia; I) the use of intravenous methylene blue; L9 the use of intravenous indocyanine green. IUILC can occur in three locations: at the origin of IMA, at the pelvic brim and during left lateral rectal dissection.[20,21] Diverticular disease seems to be the second most common diagnosis associated with IUILC for the presence of intraoperative adhesions. While, for rectal cancer, preoperative chemoradiotherapy increases the risk of IUILLC.[22-26] Metastatic cancer or bulky tumors require extensive dissection. For this reason, they have a strong predictor of IUILC.[7,27] Several studies have found that laparoscopy may increase the risk of IUIs, whereas others found a decreased risk.[17] It may be the case that laparoscopy is used in simpler colonic cases or for benign disease.[10,16] Ureteral catheter placement is not risk-free, they may but it helps the surgeons in immediate recognition and treatment of IUILC at the time of surgery diminishing morbidity and renal failure compared with cases where the diagnosis was delayed.[28] The use of MB for ureteral fluorescence imaging was shown to be safe and practical. However, when it comes to identifying the ureter during laparoscopic colorectal surgery, the current approach has no practical benefit over traditional laparoscopic imaging.[14,29]

CONCLUSION

IUILC has an incidence from 0.2% to 6%-7%. They are associated with significant mortality and morbidity, colonic inflammatory diseases such as complicated diverticulitis, malignant neoplasms, previous radiation therapy or previous operation represented as risk factors for ureteral injury. Some studies found a significant increase in the incidence of iatrogenic ureteral injuries with laparoscopy compared with open colectomies while preoperative stent placement helped surgeons in ureteral finding but seem did not to ensure intraoperative identification of injury. Increased awareness on the part of the surgeon, as well as meticulous technique, may help in reducing the incidence of IUILC.[29]

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Authours contributed substantially to the conception and planning, preparation of the draft, critical revision of the content of the manuscript and approved the final version of the manuscript to be published.

DECLARAÇÃO DE CONTRIBUIÇÃO

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