

## MODERN LYMPHATIC DISSECTION TECHNIQUES FOR PREVENTING POST RENAL TRANSPLANT LYMPHOCELE

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### Abstract

**Background and aims.** Development of a lymphocele is a well-known complication following kidney transplant. Among causative factors, recipient iliac lymphatics dissection plays an important role. Electrothermal bipolar sealing devices (LigaSure™) have been shown to decrease lymphatic leakage in a number of instances. The aim of this study was to investigate whether the use of this device decreases post-operative lymphatic complications in kidney transplant.

**Methods.** 48 patients admitted for renal transplant were included in the study. They were randomly assigned to either conventional ligation or LigaSure™ during lymphatic dissection.

**Results.** One patient in the LigaSure™ arm and 5 patients in the conventional ligation arm developed lymphocele ( $p=0.04$ ). Lymphatic drainage volumes were  $99.8\pm39.87$  ml in the LigaSure arm and  $131.46\pm54.2$  ml in the conventional ligation arm ( $p=0.02$ )

**Conclusion.** Electrothermal bipolar sealing devices exhibit safety and efficiency when used in renal transplant lymphatic dissection. In the present study, this technique proved to be superior to conventional ligation in terms of post-operative lymphatic complications.

**Keywords:** electrothermal bipolar sealing device, kidney transplant, lymphatic complication

### Background and aims

Lymphocele is a common complication following renal transplant, with an incidence which varies between 0.6% and 33.9% after the introduction of ultrasound as follow-up method [1-3]. However, a symptomatic lymphocele is only reported with a mean incidence of 5.2% [4]. Risk factors for the development of a lymphocele can be classified into surgical and medical [5]. Lymphangiographic studies have suggested two possible sources of lymphorrhagia: recipient lymphatics or graft

lymphatics, as shown by several studies [5,6]. The first instance has led to the recommendation of careful ligation of all lymphatics in the vicinity of the iliac vessels [6]. So far, no single surgical technique has proven superior to others in the prevention of lymphocele occurrence. Some studies prove the efficacy of various surgical methods, while other find no statistically significant difference. [7-9]. Medical risk factors are numerous, the two most important being acute rejection episodes and post-transplant immunomodulatory treatment with mTOR inhibitors [5].

Recently, the use of the electrothermal bipolar sealing device LigaSure™ has proven superior to other vessel

Manuscript received: 23.08.2016

Accepted: 12.10.2016

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sealing techniques in several reports, many of them in breast surgery, both for lymphatic and blood vessel sealing. In the study of Panhofer et al, the use of LigaSure™ has halved the incidence of seroma and shortened hospital stay by an average of 1 day in a cohort of female patients undergoing either breast conserving surgery or isolated axillary lymph node dissection [10]. Tomoko et al. however, reported no statistically significant difference in the appearance of seroma when comparing LigaSure™ with conventional dissection techniques. However, a difference was observed in the mean time of days until drain removal ( $6.4 \pm 2.9$  vs.  $8.2 \pm 3.8$  days) and mean total volume of fluid drained ( $365.3 \pm 242.2$  vs.  $625.1 \pm 446.6$  mL) [11]. Nespoli et al. reported only a marginal advantage of LigaSure™ use over conventional methods [12], while another study found no statistically significant difference between the two methods in axillary lymph node dissection surgery [13]. Studies in pelvic surgery demonstrated the superiority of LigaSure™ over other methods, such as in the study of Tsuda et al., where a notable difference in the incidence of symptomatic lymphocele was found when comparing tie ligation with electrothermal bipolar vessel sealing device (14% vs. 5.3%,  $p < 0.001$ ) [14]. As far as kidney transplant is concerned, a retrospective study on the use of LigaSure™ for arterial and venous sealing in living donor nephrectomy has yielded positive results, in favour of this method [15]. Three experimental studies also demonstrated the superiority or non-inferiority of electrothermal bipolar devices for lymph node sealing. Takebayashi et al. found that burst pressures in pig inguinal lymphatics were statistically significant higher when comparing LigaSure™ to electric cautery (290 mmHg vs 152.3 mmHg,  $P = 0.002$ ). Moreover, lymphorrhea was significantly lower (13.3% vs 77.3%,  $p = 0.001$ ) [16]. Another study of laparoscopic devices in pigs yielded similar results, demonstrating the superiority of LigaSure™ to electrocautery sealing (mean burst pressure 258 mmHg vs 46 mmHg,  $P < 0.05$ ). Moreover, LigaSure™ produced the least severe thermal damage among the devices tested, as assessed histopathologically [17]. Novitsky et al. also demonstrated the efficacy of electrothermal bipolar devices for sealing large porcine lymphatic vessels [18]. Considering the role of recipient lymph leakage in post-renal transplant lymphocele development and the recent proves that LigaSure™ is a reliable and efficient method in sealing lymphatic vessels, our study aimed to compare the outcomes of LigaSure™ vs electrocautery vessel sealing.

### Materials and methods

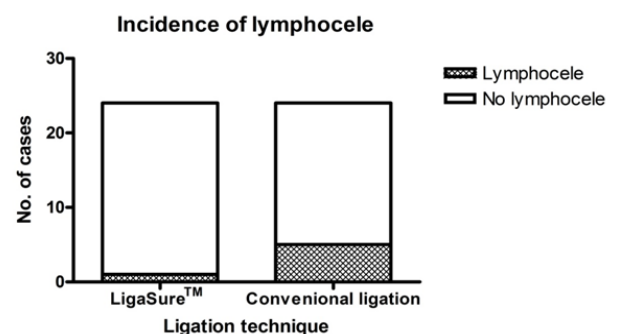
A total number of 48 patients ( $n = 48$ ), who have undergone kidney transplant at the Clinical Institute of Urology and Renal Transplant Cluj-Napoca during the period of 23.11.2015 – 23.05.2016 have been enrolled in the study, after informed consent was obtained. The patients were randomized into two groups: one group underwent right iliac fossa transplant using LigaSure™

dissection devices ( $n = 24$ ) and the second group underwent left iliac fossa transplant using conventional ligation and monopolar coagulation. The LigaSure™ devices used were: LigaSure Atlas™ 20 cm Hand Switching Open Instrument, LigaSure™ Dolphin Tip 20 cm Open Instrument and LigaSure Precise™ Open Instrument.

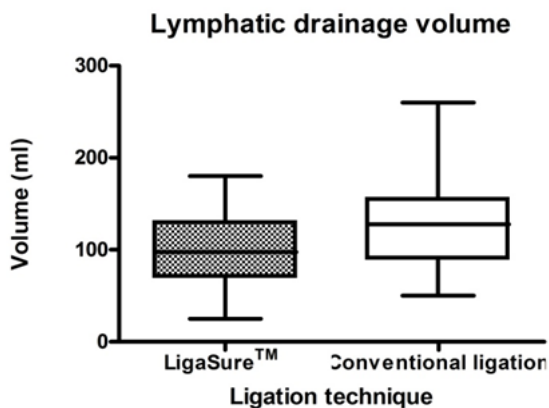
Lymphatic drainage was measured for 30 days post-operatively in both groups. The second follow-up stage was done 14 days after the end of the hospital stay and it consisted of ultrasonographic evaluation. Data was collected and statistical analysis was performed.

### Results

The study was conducted during the period 23.11.2015 – 23.05.2016 and a total of 48 patients participated, randomly divided into two groups: one group in which different LigaSure devices were used to seal lymphatic vessels ( $n = 24$ ) and another in which conventional ligation was used ( $n = 24$ ); 17 of the patients were females (35.41%) – 8 in the LigaSure group and 9 in the conventional ligation group, and 31 males (64.59%) – 16 respectively 15 in the two groups. The mean ages in the two groups were  $37.75 \pm 12.62$  (LigaSure) respectively  $44.17 \pm 13$  (conventional ligation) (Table I). In 6 cases (12.5%), the kidney was harvested from a living donor (3 in each group) and in 42 cases (87.50%) from dead donors. The LigaSure group ( $n = 24$ ) received a transplant in the right iliac fossa, while the rest of the patients, for which conventional ligation was used, ( $n = 24$ ) had the kidney transplanted in the left iliac fossa. Postoperative lymphocele was developed with an incidence of 4.16% in the LigaSure arm vs. 20.83% in the conventional ligation group (1, respectively 5 patients in the two groups) ( $p = 0.04$ ) (Figure 1). Postoperative lymphatic drainage volumes in the LigaSure group were  $99.8 \pm 39.87$  ml and  $131.46 \pm 54.2$  ml in the conventional ligation arm respectively ( $p = 0.02$ ) (Figure 2).



**Figure 1.** Incidence of lymphocele in LigaSure™ vs conventional ligation group.



**Figure 2.** Lymphatic drainage volume in LigaSure™ vs conventional ligation group.

**Table I.** Patient characteristics and post-operative evolution – lymphocele development and lymphatic drainage volume.

	LigaSure™ (n=24)	Conventional ligation (n=24)
Age	37.75±12.62 (23 – 62)	44.17±13 (18 – 66)
Sex		
Male	66.6% (n=16)	62.5% (n=15)
Female	33.3% (n=8)	37.5% (n=9)
Lymphocele development	4.16%	20.83%
Volume of lymphatic drainage	99.8±39.87 ml (90 – 180)	131.46±54.2 ml (50 – 260)

**Discussion**

Lymphocele and lymphorrhea are common lymphatic complications following kidney transplant. In the recent years, post-transplant lymphoceles have been diagnosed increasingly frequent due to the introduction of ultrasound in the follow-up protocol of transplant patients. Since the incidence of other postoperative fluid collections, such as urinoma, seroma, hematoma or abscesses has decreased significantly due to improved surgical techniques, lymphocele has become the most common complication of this type following kidney transplant. Several causes have been identified that can lead to its’ development. Surgical technique can contribute, among others, to the occurrence of a lymphocele. Both donor and recipient vessels can be the source of lymphatic leakage and no single surgical technique or instrument has shown up to date to prevent the this complication.

LigaSure™ technology creates vessel fusion using a combination of pressure and energy. These denature the collagen, elastin fibres and the rest of the connective tissue within the vessels and then allows for the proteins to form a seal, which fuses the walls. In this way, the lumen

is theoretically obliterated, and little blood or lymph loss occurs. Most studies assessing the LigaSure™ device in kidney surgery have been conducted using laparoscopic methods, some in experimental settings. In this context, this device has shown advantages compared to other methods in terms of sealing time, burst pressure, thermal spread, intraoperative blood loss, operative time, conversion rate, and postoperative course, mostly in the case of donor nephrectomy [19-21]. This device has been shown to be superior to other techniques also in open surgery [22-23]. However, up to date, few studies have investigated its’ performance in the case of kidney transplant recipient lymphatic dissection. Most of the studies assessing the utility of electrothermal bipolar devices in reducing post surgical lymphatic complications have been conducted in breast surgery.

Consequently, we aimed to establish whether the use of bipolar sealing devices (LigaSure Atlas™ 20 cm Hand Switching Open Instrument, LigaSure™ Dolphin Tip 20 cm Open Instrument and LigaSure Precise™ Open Instrument) is superior to conventional ligation techniques in reducing post-transplant lymphorrhea and/or lymphocele development.

Similar to other studies [11-12,14], our results show an improvement in lymphatic leakage with the use of LigaSure™. Patients have been followed-up ultrasonographically after the procedure and a statistically significant reduction in the incidence of lymphocele was observed when the electrothermal bipolar sealing device was used. One case of lymphocele (4.16%) was observed in the LigaSure™ group, whereas 5 patients (20.83%) in the conventional ligation group developed this complication (p=0.04). Moreover, the use of LigaSure™ seems to significantly decrease the volume of postoperative lymphatic drainage, compared to conventional ligation techniques: 99.8±39.87 ml vs 131.46±54.2 ml, p=0.02.

**Conclusion**

Our study shows that the use of LigaSure™ technology can be safely employed during recipient iliac lymphatic vessel dissection, and it yields certain advantages in comparison to conventional ligation. This technique seems to be superior in the setting of kidney transplant in regards to post-operative formation of a lymphocele or lymphorrhea. It is a fast, secure and efficient way to permanently fuse vessels and thus avoid post-transplant lymphatic complications. However, larger studies are called for in order to make a firm recommendation regarding the use of bipolar thermal devices as instruments of choice in lymphatic dissection during kidney transplant.

**Acknowledgements**

This research was supported by the University of Medicine and Pharmacy “Iuliu Hatieganu”, grant no. 22707/89/23.11.2015.

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