




Laparoscopically assisted ilio-inguinal lymph node dissection versus inguinal lymph node dissection in melanoma

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Practice points

- Inguinal or ilio-inguinal lymphadenectomy is still needed in melanoma management.
- Morbidity of inguinal or ilio-inguinal lymphadenectomy can be reduced with the preservation of greater saphenous vein and the use of minimally invasive therapies.
- Other technical details to reduce morbidity of inguinal lymphadenectomy, like transposition of sartorius muscle or use of fibrin seem to be ineffective.
- Always re-evaluate your surgical practice and look for new approaches that may minimize postoperative course.
- Inguinal microscopic or CT scan/PET-CT negative pelvic inguinal lymph node involvement may be associated to pelvic lymph node involvement.
- The need to add pelvic lymphadenectomy to inguinal lymphadenectomy in melanoma with negative clinical pelvic lymph node involvement will hopefully be elucidated by the EAGLE-FM trial.

Aim: Morbidity of open inguinal lymphadenectomy (OIL) is high. We use laparoscopy for pelvic time, preservation of the greater saphenous vein and transverse inguinal incisions (laparoscopically assisted ilio-inguinal lymphadenectomy, LIL) to improve postoperative outcomes. **Patients & methods:** Retrospective comparison of 14 patients who underwent LIL and seven patients who underwent OIL. **Results:** Fourteen LIL compared with seven OIL showed a statistically significant reduction in morbidity (15.3 vs 75%) and hospital stay (7 vs 15.7 days). Pelvic lymph node involvement (27%) was not detected preoperatively. With a mean follow-up of 36.2 (range: 3–137) months, local recurrence rate was 58.3% in LIL and 40% in OIL. Overall survival was significantly higher in OIL than in LIL. **Conclusion:** Compared with OIL, LIL reduced postoperative complications and hospital stay.

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Following the results of the MSLT-II and DeCOG-SLT trials [1,2], the melanoma clinical guidelines have accepted observation instead of completion lymph node dissection (CLND) in case of microscopic lymph node involvement (positive sentinel lymph node biopsy). However, the melanoma surgeon should still have inguinal lymphadenectomy or ilio-inguinal lymphadenectomy in their armamentarium since approximately between 18 and 26% of patients with positive sentinel lymph node under observation may develop clinical lymph node involvement [3,4]. To this percentage, we must add patients who have clinical/palpable nodal involvement at presentation, which is approximately 38% [3].

One of the factors that impelled investigators to study the possibility of observation instead of CLND is the morbidity associated to this procedure. Morbidity of inguinal and ilio-inguinal lymphadenectomy has been as high as 52% of patients in a recent meta-analysis [5]. Therefore, many physicians have introduced technical modifications to reduce morbidity, for example: transposition of the sartorius muscle, use of fibrin, conservation of the greater saphenous vein (GSV) and minimally invasive incisions [5]. Other groups have opted for minimally invasive

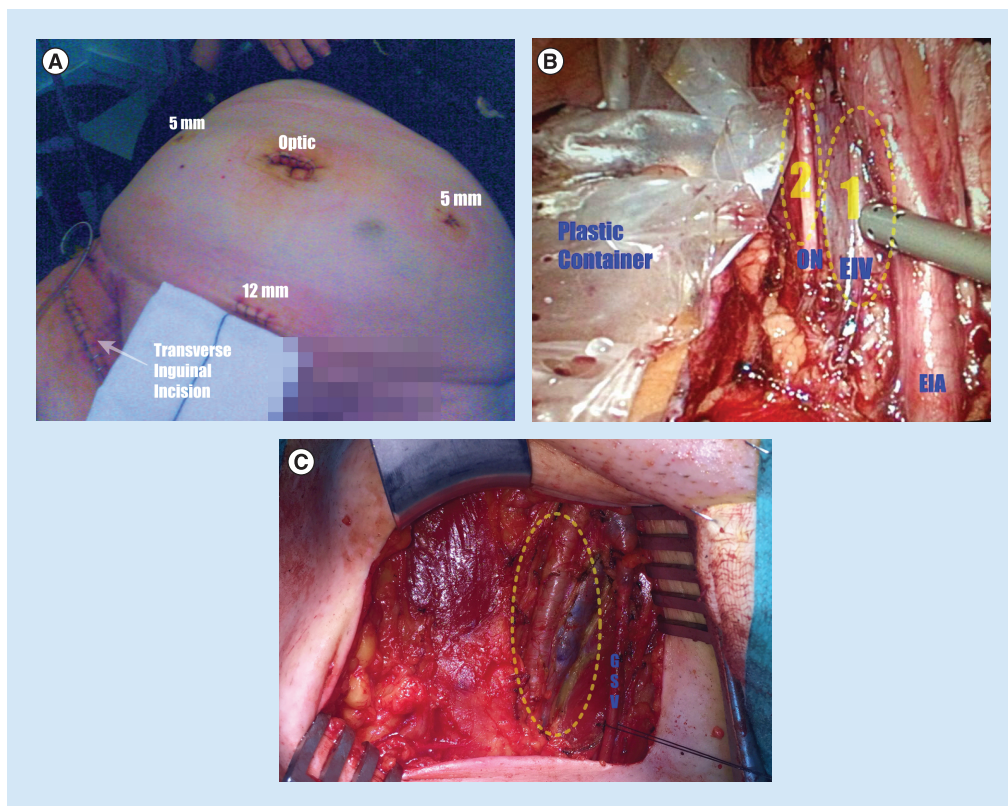


Figure 1. Laparoscopically assisted ilio-inguinal lymphadenectomy procedure. (A) Post operative view of laparoscopically assisted ilio-inguinal lymphadenectomy (LIIL) with trocar distribution for the laparoscopic part and transverse incision for the inguinal part. (B) Laparoscopic part of LIIL, right side. EIA and vein EIV are the anatomical references for medial iliac external nodes (yellow-dotted zone 1); the ON is the anatomical reference for obturator nodes (yellow-dotted zone 2); a plastic container is used for lymph node retrieval. (C) Inguinal part of the LIIL, right side. Transverse inguinal incision permits dissection of lymph nodes from the inguinofemoral content to the apex of the femoral triangle (yellow-dotted circle). The greater saphenous vein has been preserved. EIA: External iliac artery; EIV: External iliac vein; GSV: Greater saphenous vein; ON: Obturator nerve.

approaches for pelvic dissection and for inguinal dissection [6]. Following this tendency, our group switched from open inguinal lymphadenectomy (OIL) [7] to laparoscopically assisted pelvic lymph node dissection and inguinal lymphadenectomy through transverse incision (LIIL) (instead of the ‘lazy S’ described by Karakoisis [8]), preserving the GSV whenever possible.

This article compares our results with both techniques, analyzing the current controversies through this comparison.

Patients & methods

This is a retrospective study comparing our LIIL case series with a historical OIL case series. In the LIIL technique, four trocars are inserted. One trocar is placed in the umbilicus for optics, and a second 10- to 12-mm trocar is placed centrally just above the pubic bone. The suprapubic trocar generally is disposable to facilitate lymph node extraction. Two 5-mm trocars are placed between the epigastric vessels and the anterior superior iliac spine (Figure 1A). The anatomic borders of lymphadenectomy at this step are the epigastric bundle and the inguinal ligament. The adventitia of the vessels is dissected, and the medial iliac external nodes are retrieved (Figure 1B). All the lymphatic material between the vessels and the pelvic wall is retrieved. Then the lymphatic pad of the obturator fossa is detached from the pelvic wall and collected after further visualization of the obturator nerve (Figure 1B). The limits of dissection are anterior to the pubic bone, medial to the external iliac vessels, inferior to the obturator nerve and posterior to the lumbosacral fossa where the lumbosacral nerve can be identified. The nodes are retrieved in a plastic container. The inguinal part of the LIIL is performed using a transverse incision and involved complete

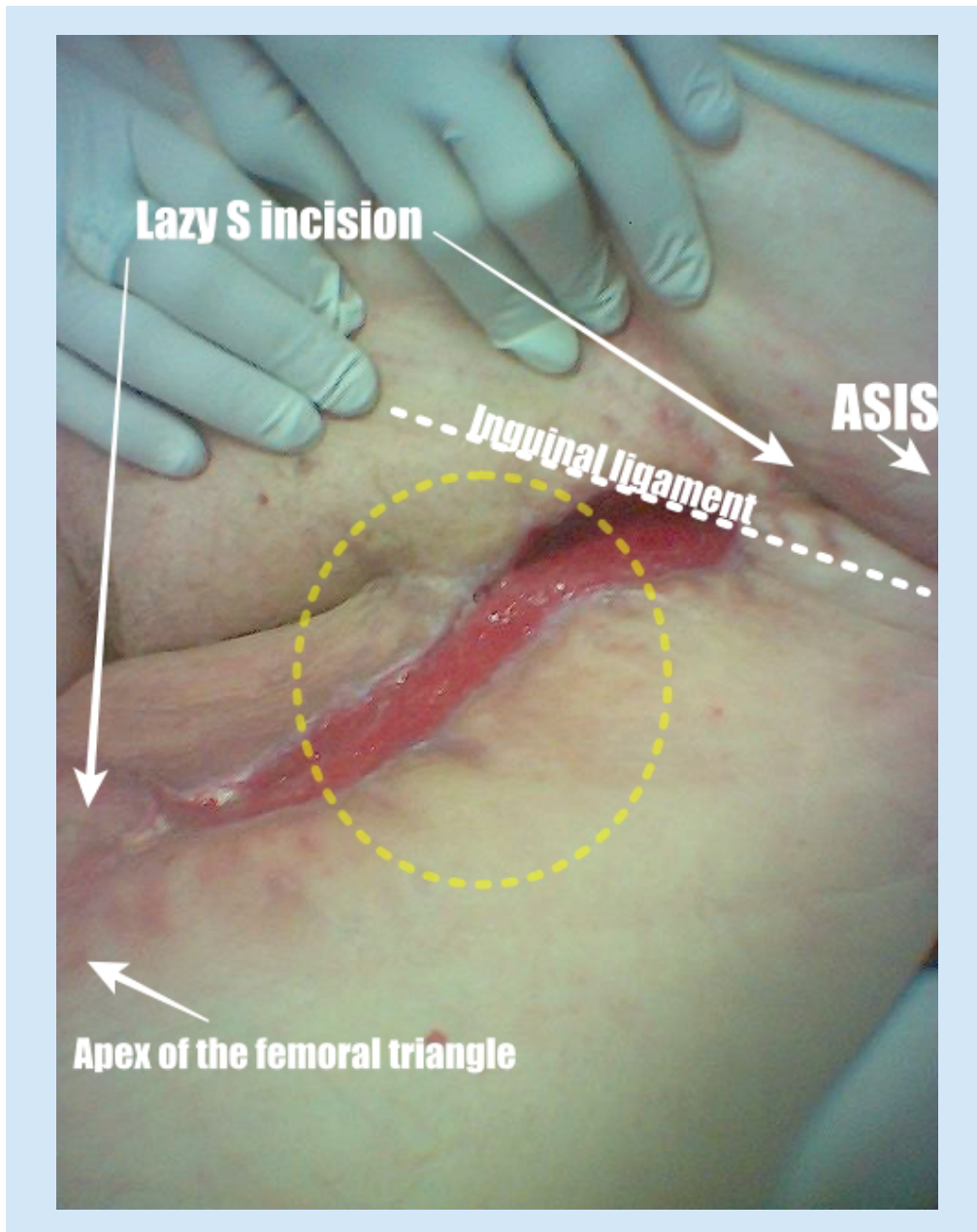


Figure 2. Postoperative view of open inguinal lymphadenectomy, left side. 'Lazy S' inguinal incision (from ASIS to the apex of the femoral triangle) permits complete dissection of lymph nodes from the inguinofemoral content, below the inguinal ligament, to the apex of the femoral triangle (yellow-dotted circle). ASIS: Anterosuperior iliac spine.

dissection of lymph nodes from the inguinofemoral content to the apex of the femoral triangle (Figure 1C). The GSV is preserved whenever possible.

The OIL was performed via a 'lazy S' inguinal incision (from the anterosuperior iliac spine to the apex of the femoral triangle) and involved complete dissection of lymph nodes from the inguinofemoral content to the apex of the femoral triangle (Figure 2). Sartorius muscle transposition to cover and protect femoral vessels was always performed. The GSV was never preserved. Demographic, oncological and surgical technique data as well as morbidity and hospital stay were collected. The means of the values in the quantitative variables were compared using the Mann–Whitney *U* test and the qualitative variables the Fisher's exact test (FET). The overall survival curves were calculated by the Kaplan–Meier procedure.

Table 1. Demographic, oncological and technical data comparison between laparoscopically assisted ilio-inguinal lymphadenectomy and open inguinal lymphadenectomy.

Parameters	LIL	OIL	Test
N	14	7	
M:F	8:6	3:4	
AGE	64.3	65.1	UMW = 34; $p > 0.05$
BMI	27.5	28.4	UMW = 14; $p > 0.05$
Melanoma T stage, %	Tx 14.2 Tis 7 T1 0 T2 21.2 T3 14.2 T4 42.7	Tx 0 Tis 0 T1 14.2 T2 14.2 T3 28.5 T4 42.8	
Surgical time (min)	209	182	UMW = 34.5; $p > 0.05$
GSV preservation (%)	50	0	FET = 0.046; $p < 0.05$
Hospital stay (days)	7	15.7	UMW = 10; $p < 0.05$
Drainage output at discharge (cc)	233.7	52.5	UMW = 2; $p < 0.05$
Duration of drainage (days)	16.7	13.4	UMW = 25.5; $p < 0.05$
Postoperative complications (%)	15.3	75	FET = 0.023; $p < 0.05$

CC: Cubic centimeter; FET: Fisher's exact test; GSV: Greater saphenous vein; LIL: Laparoscopically assisted ilio-inguinal lymphadenectomy; M:F: Male female ratio; OIL: Open inguinal lymphadenectomy; UMW: Mann–Whitney U test.

Results

A total of 14 LIL were collected and compared with a historical series of seven OIL. Both populations were demographically comparable (Table 1). They were also comparable regarding the use of systemic treatments (69.2% of the LIL and 75% of the OIL, FET = 1; $p > 0.05$). Sixty percent of indications of lymphadenectomy were due to clinical/macroscopic/palpable inguinal lymph node involvement at presentation. The remaining 40% of lymphadenectomies were indicated as CLND due to microscopic involvement of the sentinel node.

When analyzing the surgical technique, no statistically significant differences were found in the operative time of LIL and OIL (Table 1). The preservation of the GSV in the LIL could be achieved in half of the cases.

Given the relevance of the topic in the literature, we also compared the cases in which the GSV was not preserved (50% LIL and all the OIL) with those in which the GSV was preserved. Statistically significant differences were found in hospital stay (13 vs 4 days) and in the higher incidence of postoperative complications (FET = 0.035; $p < 0.05$), but not in duration of drainage (15.3 vs 16.3 days).

Regarding postoperative course, the length of hospital stay and incidence of postoperative complications were statistically significantly higher in OIL than LIL (Table 1). The most frequent postoperative complication of our case series was infection (19%) followed by cutaneous necrosis, with or without wound breakdown, (14.2%). About 42.5% of the LIL presented lymphedema, this parameter was not recorded in the OIL series.

When comparing path results, a greater number of lymph nodes were obtained in the LIL compared with the OIL (13.1 vs 8.5) but this difference was not statistically significant (Mann–Whitney U test = 16; $p > 0.05$). The pathological pelvic lymph node involvement was 27%, in all cases with concomitant inguinal lymph node involvement (25% microscopic). Or from another point of view, 11% of clinically negative groins had pathologically proven pelvic involvement, while this rate increased to 60% when inguinal lymphadenopathies were palpable. Of note, this pelvic lymph node involvement was not detected preoperatively in any case (half of the cases used CT scan and the other half used PET-CT). The lymph node (LN) ratio (number of nodes affected/number of nodes resected) of both LIL and OIL was 0.23.

With a mean follow-up of 36.2 (range: 3–137) months, local recurrence rate was 58.3% in LIL and 40% in OIL, this difference not being statistically significant (FET = 0.619; $p > 0.05$).

Overall survival was significantly higher in the OIL group than in the LIL group (Figure 3).

Discussion

In this article, we tried to elucidate if our change in technique for lymphadenectomy, from OIL to LIL has been beneficial in terms of operative and postoperative outcomes. The absence of differences in surgical times between both techniques (the LIL comprising the OIL – but using a transverse incision and without sartorius muscle

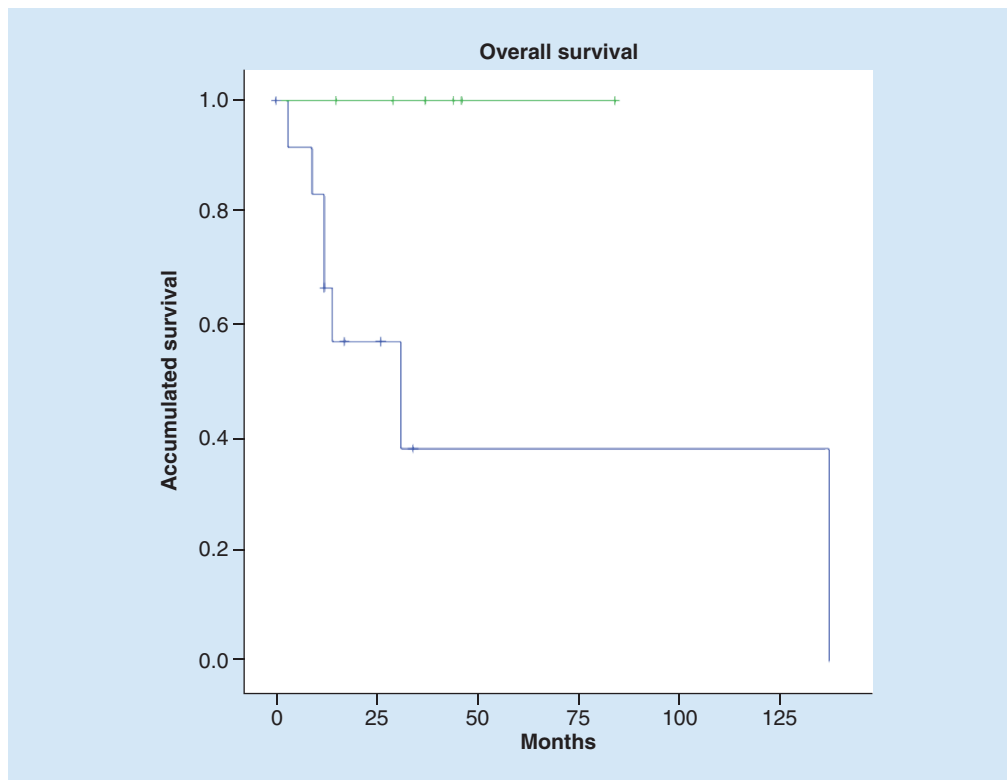


Figure 3. Laparoscopically assisted ilio-inguinal lymphadenectomy and open inguinal lymphadenectomy survival curves. Green: open inguinal lymphadenectomy. Blue: laparoscopically assisted ilio-inguinal lymphadenectomy.

transposition – plus the laparoscopic pelvic time), can only be explained by the fact that it is a comparison with a historical series. The learning curve (more patients in the OIL historical series) as well as the abandonment of the transposition of the sartorius muscle (with the change to LIIL) could possibly explain the lack of significant differences in surgical time.

In our experience, the preservation of the GSV (Figure 1C) adopted with the LIIL is an effective measure to reduce postoperative complications and hospital stay. The abandonment of the transposition of the sartorius muscle adopted with the LIIL was not associated with a higher incidence of postoperative complications. These findings are in line with the findings of Söderman *et al.*, who described that the use of fibrin doesn't confer benefits [5].

The significant decrease in the incidence of postoperative complications (and therefore in hospital stay) is the main finding of our analysis. This change of technique (with fewer wound complications) allows us to discharge patients with ambulatory drainage management and with a significant earlier drainage removal. Other authors have changed the open approach to videoscropy of not only the pelvic time of lymphadenectomy, but also the inguinal time [6]. The addition of inguinal videoscropy doubled the surgical time. The wound infection rate was 13% and seroma formation 30%, with no evidence of wound dehiscence [6]. The median hospital stay (7 days) was similar to our series. The lymphedema rate (8%) was much lower than in our series. These results would suggest that a greater decrease in morbidity can still be achieved (especially in wound dehiscence and lymphedema), if a completely videoscopic approach is adopted. Table 2 presents a review of the inguinal videoscopic procedure. After the initial experiences published with small patient numbers, some more robust case series can be analyzed [7]. The rate of complications remains high despite the use of videoscropy. Lymphedema rate is 54% [7], even higher than in our experience with LIIL. The most remarkable outcome is that, generally, mean hospital stay has been reduced to 1 day [7,9,10]. Finally, other authors have preferred to undertake a videoscopic inguinal approach followed by open iliac lymph node dissection via a separate skin incision [11]. Compared with LIIL, mean operative time was halved, but complication rate doubled (37.5%). The rate of lymphedema (44.8%) – mild and moderate – was slightly higher than in LIIL.

Table 2. Review of the results of minimally invasive approach to groin lymph node dissection in melanoma.

Study (year)	Technique	n	Operative time (MEAN) (min)	Complication rate, %	Hospital stay (MEAN) (days)	Ref.
Jakub (2017)	MIIL	77	N/A	71	1	[7]
Delman (2010)	MIIL	5	180	40	1	[9]
Ichimiya (2013)	MIIL	5	163	20	N/A	[12]
Abbott (2013)	MIIL	13	245	0	1	[10]

MIIL: Minimally invasive inguinal lymph node dissection; N/A: Not available.

The median number of lymph nodes obtained in both the LIIL and the OIL was higher than the 90th percentile of results from reference centers in the treatment of melanoma [13]. This quality assessment of lymphadenectomies was suggested by Spillane *et al.* [14], in the absence of an established lymph node cut-off number that should contain a lymphadenectomy. Obviously, we obtained a greater number of lymph nodes in the LIIL, although this difference with the OIL did not reach statistical significance. In addition, BMI was not a confounding factor [15], as there was not a significant difference between the two groups.

It is necessary to express that with an analyses of 21 patients, our patient numbers are too low to draw any conclusion regarding oncological outcomes. Nevertheless, we would like to present to the readership, our reflections after contrasting our discrete experience with the literature, while awaiting the results of randomized trials.

Our local recurrence rate was higher than in the literature, which varies from one digit to 35% [6,16,17]. The fact that 60% of the patients in our series had macroscopic inguinal involvement, with a LN ratio category B (10–25%) and more than 40% of T4s, reflect a locally advanced melanoma case series, with an expected worse local recurrence rate. It has been proposed that there are differences between microscopic and macroscopic inguinal involvement in relation to tumor biology, incidence of lymph node involvement and recurrence pattern or survival [16]. Perhaps our high incidence of macroscopic node involvement justifies the higher incidence of local recurrence and even the paradox of a worse incidence of local recurrence with more extensive surgery.

Another finding from our series has been better survival following OIL compared with LIIL. First, it is worth highlighting the methodological problem that Kaplan–Meier survival curves lose reliability with an N below 30. Nevertheless, other authors found better survival from OIL to LIIL; however, unlike our results, statistical significance was not demonstrated [16,18]. Contrary to the findings of Rossi *et al.* [15], the greater number of resected nodes has not been associated with a better prognosis of LIIL (Figure 3). Rossi *et al.* also linked low values (<0.1) in the LN ratio to a better prognosis [15]. We couldn't verify this fact in our small series, where the OIL LN ratio should have theoretically been lower than in the LIIL. The improvement in the prognosis with more extensive lymphadenectomies seems to be limited to patients with microscopic nodal disease [15].

The EAGLE-FM trial, currently recruiting, is intended to corroborate if the extent of lymphadenectomy (adding pelvic lymphadenectomy to inguinal lymphadenectomy) influences local control and patient survival [16]. It has been advocated that pelvic lymphadenectomy should be added to inguinal lymphadenectomy when there is clinically gross involvement of the groin, when there are clinically detectable deep lymph nodes, when Cloquet's node is histologically positive or when pelvic CT scan demonstrates pelvic lymphadenopathy [17]. If we had followed the indication of performing pelvic lymph node dissection only if inguinal lymph node involvement is macroscopic, one quarter of our patients with pathologically proven pelvic involvement would have not received lymphadenectomy of this territory. On the other hand, the performance of pelvic lymphadenectomy only in our cases of positive imaging tests would not have been a successful approach either. Even with the use of CT scan and PET-CT, a third of our patients with negative imaging tests did have pathologically proven pelvic involvement.

In conclusion, the change from OIL to LIIL has allowed us to reduce postoperative complications and hospital stay. In our limited experience, preservation of GSV is an effective measure to reduce postoperative complications.

Future perspective

New developments in biological therapy for melanoma will probably leave lymphadenectomy only for relapsed or resistant lymph node disease. Nevertheless, surgeons must always incorporate novel approaches (like minimally invasive techniques) to improve results.

Author contributions

E Boldo: conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, writing; A Mayol: conceptualization, data curation, formal analysis, investigation, methodology, writing; R Lozoya: conceptualization, data curation, formal analysis, investigation, methodology, writing; A Coret: data curation, formal analysis, writing; D Escribano: data curation, formal analysis, writing; C Fortea: data curation, formal analysis, writing; A Muñoz: data curation, formal analysis, writing; JC Pastor: data curation, formal analysis, writing; GPD Lucia: data curation, formal analysis, writing.

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Ethical conduct of research

The authors certify that appropriate institutional review board approval has been obtained and that informed consent has been obtained from the participants involved, specifically for graphic material taken for academic or scientific purposes.

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