Meta-analysis

Journal of INTERNATIONAL MEDICAL RESEARCH

Journal of International Medical Research
2016, Vol. 44(5) 985–993

DOI: 10.1177/0300060516659824
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Laparoendoscopic single-site surgery varicocelectomy versus conventional laparoscopic varicocele ligation: A meta-analysis

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Abstract

Objective: To perform a meta-analysis of data from available published studies comparing laparoendoscopic single-site surgery varicocelectomy (LESSV) with conventional transperitoneal laparoscopic varicocele ligation.

Methods: A comprehensive data search was performed in PubMed and Embase to identify randomized controlled trials and comparative studies that compared the two surgical approaches for the treatment of varicoceles.

Results: Six studies were included in the meta-analysis. LESSV required a significantly longer operative time than conventional laparoscopic varicocelectomy but was associated with significantly less postoperative pain at 6 h and 24 h, a shorter recovery time and greater patient satisfaction with the cosmetic outcome. There was no difference between the two surgical approaches in terms of postoperative semen quality or the incidence of complications.

Conclusion: These data suggest that LESSV offers a well tolerated and efficient alternative to conventional laparoscopic varicocelectomy, with less pain, a shorter recovery time and better cosmetic satisfaction. Further well-designed studies are required to confirm these findings and update the results of this meta-analysis.

Keywords

Laparoscopy, varicocelectomy, laparoendoscopic single-site surgery, meta-analysis

Date received: 26 March 2016; accepted: 24 June 2016

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Introduction

Varicoceles are found in approximately 15% of the general male population, but in men with primary or secondary infertility their prevalence is 19–41% and 45–81%, respectively.[1] These findings suggest that varicoceles have an impact on spermatogenesis but the underlying mechanisms are still unresolved. However, some studies have demonstrated that varicocele repair can improve male infertility.[2]

Laparoscopic varicocelectomy has been widely used to treat varicoceles, and this technique has been reported to be associated with a low incidence of persistent or recurrent hydrocele.[3] Moreover, this procedure is especially effective in bilateral cases.[4] Laparoendoscopic single-site surgery (LESS) is minimally invasive and since its first use in 2007, urologists have successfully performed various procedures using this method, including partial nephrectomy, pyeloplasty, orchiectomy, orchiopexy, varicocelectomy, ureterolithotomy, sacrocolpopexy, renal biopsy, renal cryotherapy and adrenalectomy.[5,6] To assess the advantages and disadvantages of LESS for varicocele ligation, a meta-analysis of studies comparing LESS varicocelectomy (LESSV) with conventional laparoscopic varicocele ligation (CTL-VL) was performed.

Methods

The meta-analysis was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement criteria.[7] Electronic searches were conducted in Pubmed and Embase for studies in English published before 20 October 2014. The search terms used were 'laparoscopic single site' or 'laparoscopic single incision' and 'varicocelectomy', using the explode function to also include other more specific terms under these headings. All randomized controlled trials (RCTs) and non-RCTs comparing LESSV with a conventional laparoscopic approach for varicocele repair across all age groups were considered, including both prospective and retrospective studies. The retrieved articles were screened for potential inclusion by two authors (M.L. and Z.W.) and any disagreement was resolved by consensus. The same two authors evaluated the methodological quality of the eligible articles using the Cochrane Collaboration quality assessment tool, which includes a judgement of randomization sequences, blinding technique, allocation concealment and other potential biases.[8]

Statistical analyses

The meta-analysis was performed using Review Manager (RevMan) software version 5.2 (The Cochrane Collaboration, The Nordic Cochrane Centre, Copenhagen). Continuous outcomes were presented in the form of the standardized mean difference (SMD) while discontinuous data were presented in the form of relative risk (RR), both with 95% confidence intervals (CIs). Heterogeneity among studies was estimated using the I^2 statistic. Studies with $I^2 > 50\%$ were considered to be of high heterogeneity and were analysed using the random effect model. For studies with $I^2 \leq 50\%$, the fixed effect model was used. A P-value < 0.05 was considered to be statistically significant.

Results

A total of 959 studies were identified using the research strategy (Figure 1).

Of these, 953 articles that were conference abstracts, editorials, on unrelated topics or duplicate studies were excluded. Therefore, six studies[9–14] involving a total of 393 patients were included in the meta-analysis (Table 1).

Using data from the five studies that provided the mean ± SD operating time,

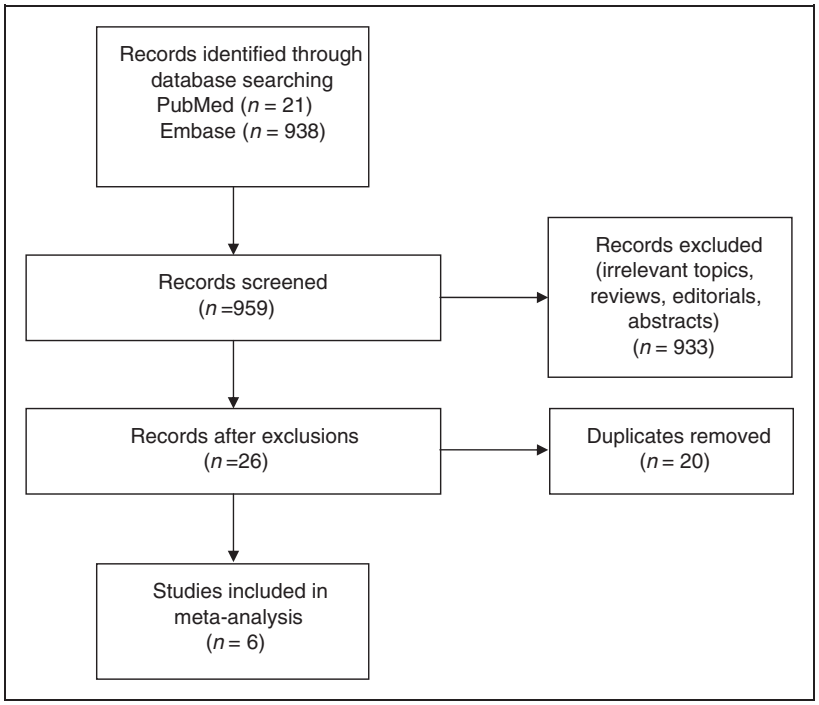

Figure 1. Flow diagram showing the selection process for studies included in the meta-analysis.

Table 1. Characteristics of studies comparing laparoendoscopic single-site varicocelectomy (LESSV) with conventional transperitoneal laparoscopic varicocele ligation (CTL-VL) included in the meta-analysis.

Reference	Country	Subgroup	Age, years	No. of patients	Site of varicocele	
					Left	Bilateral
Bansal et al. (2014)[9]	USA	LESSV	15 (12–20)	11	10	1
		CTL-VL	16 (12–23)	32	31	1
Friedersdorff et al. (2013)[10]	Germany	LESSV	28.4 ± 7.8	20	–	–
		CTL-VL	27.1 ± 9.2	79	–	–
Hao et al. (2012)[11]	China	LESSV	15.3 ± 2.6	6	–	–
		CTL-VL	13.7 ± 1.6	7	–	–
Lee et al. (2012)[12]	Republic of Korea	LESSV	32.6 ± 14.8	39	33	6
		CTL-VL	33.2 ± 15.1	43	39	4
Marte et al. (2014)[13]	Italy	LESSV	11–17	44	–	–
		CTL-VL	11–17	25	–	–
Wang et al. (2014)[14]	China	LESSV	30.3 ± 8.3	44	–	–
		CTL-VL	29.5 ± 7.5	43	–	–

Data presented as number of patients, mean ± SD, median (range) or range; – indicates data not available.

meta-analysis showed that operating time was significantly longer in the LESSV group compared with the CTL-VL group ($P = 0.03$; Figure 2). Pain scores were assessed postoperatively after 6 h in two studies, and were significantly lower in the LESSV group compared with the CTL-VL group ($P = 0.0007$; Figure 3a). Four studies

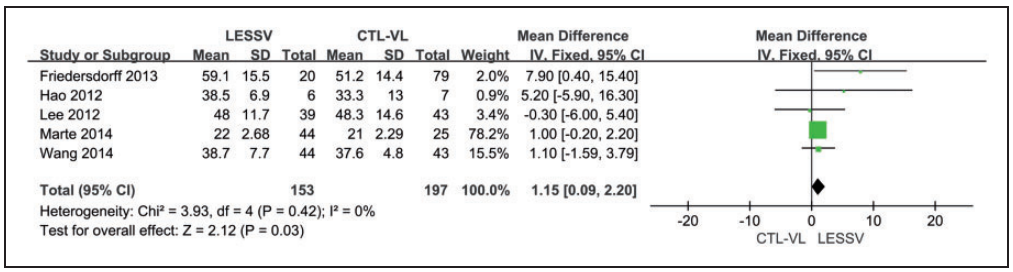

Figure 2. Forest plot of pooled analysis of data concerning operating times.
LESSV, laparoendoscopic single-site surgery varicocelectomy; CTL-VL, conventional transperitoneal laparoscopic varicocele ligation; Fixed, fixed effects model; IV, inverse variance; CI, confidence intervals, df, degrees of freedom.

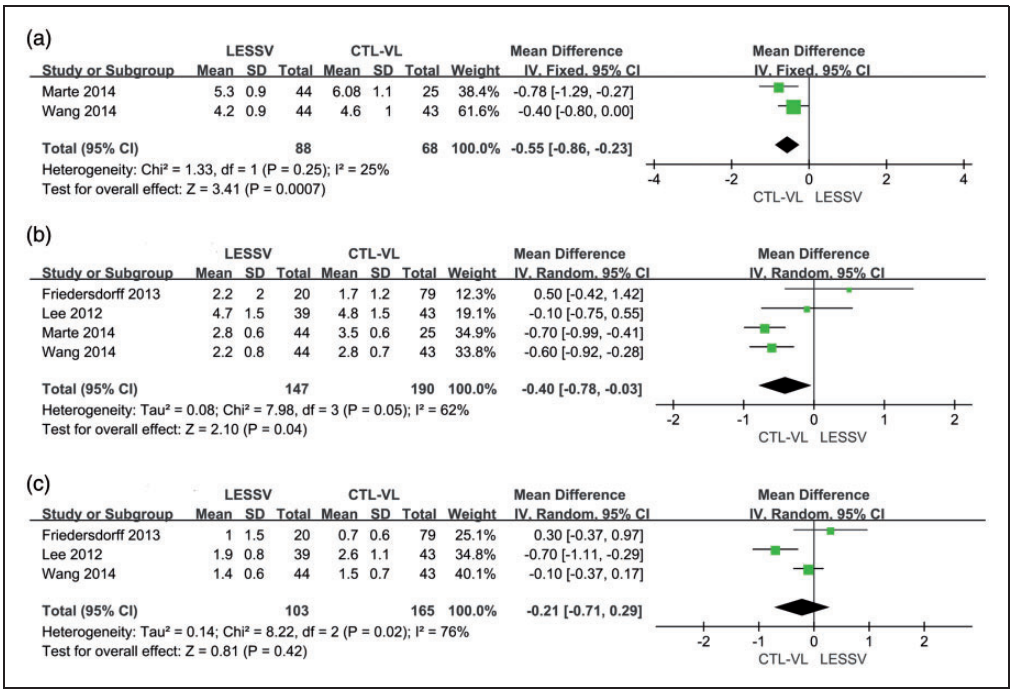

Figure 3. Forest plot of pooled analysis of data concerning postoperative pain: (a) pain score after 6 h; (b) pain score after 24 h; (c) pain score after 48 h.
LESSV, laparoendoscopic single-site surgery varicocelectomy; CTL-VL, conventional transperitoneal laparoscopic varicocele ligation; Fixed, fixed effects model; Random, random effects model; IV, inverse variance; CI, confidence intervals, df, degrees of freedom.

investigated pain postoperatively after 24 h; again scores were significantly lower in the LESSV group compared with the CTL-VL group ($P = 0.04$; Figure 3b). Data from three studies that assessed pain 48 h after the operation showed no difference in pain scores between the two types of varicocelectomy.

Hospital stay was investigated in four studies; analysis showed that there was no significant difference in the length of stay between the LESSV group and the CTL-VL group (Figure 4). Time to return to normal activity was assessed in two studies and was significantly shorter in the LESSV group compared with the CTL-VL group ($P < 0.00001$; Figure 5). Patient satisfaction with the cosmetic appearance of the wound was evaluated in two studies; analysis showed that patient satisfaction was greater with LESSV than with CTL-VL ($P = 0.001$, Figure 6).

Pooled analyses of data from the two studies that assessed semen quality showed no significant differences between the two types of surgery in terms of semen count, semen motility or semen morphology (Figure 7). Pooled analyses of data from four studies showed that there were no significant differences between the two surgical approaches in terms of hydrocele persistence (Figure 8a), and data from two studies showed there was no difference between the two types of surgery in the rate of hydrocele recurrence (Figure 8b).

Discussion

This meta-analysis of data from six comparative studies showed that LESSV was

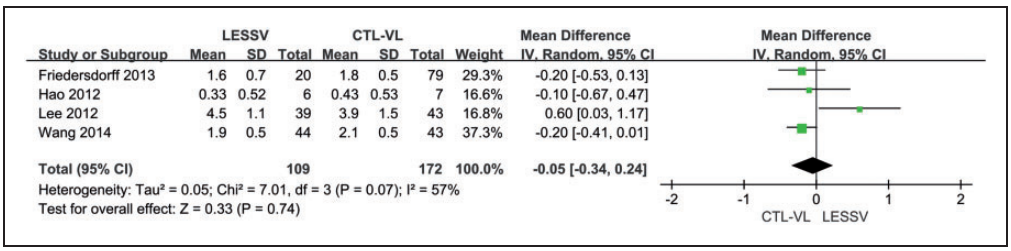

Figure 4. Forest plot of pooled analysis of data concerning hospital stay.
LESSV, laparoendoscopic single-site surgery varicocelectomy; CTL-VL, conventional transperitoneal laparoscopic varicocele ligation; Random, random effects model; IV, inverse variance; CI, confidence intervals, df, degrees of freedom.

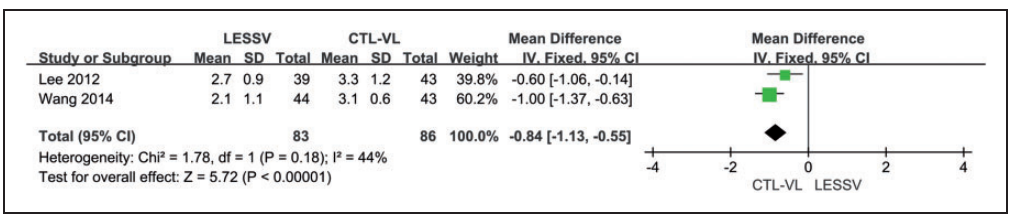

Figure 5. Forest plot of pooled analysis of data concerning time to return to normal activity.
LESSV, laparoendoscopic single-site surgery varicocelectomy; CTL-VL, conventional transperitoneal laparoscopic varicocele ligation; Fixed, fixed effects model; IV, inverse variance; CI, confidence intervals, df, degrees of freedom.

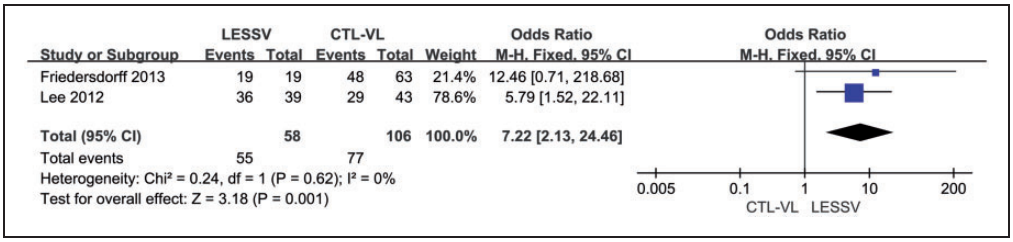

Figure 6. Forest plot of pooled analysis of data concerning patient satisfaction with cosmetic results.
LESSV, laparoendoscopic single-site surgery varicocelectomy; CTL-VL, conventional transperitoneal laparoscopic varicocele ligation; MH, Mantel–Haenszel test; Fixed, fixed effects model; CI, confidence intervals, df, degrees of freedom.

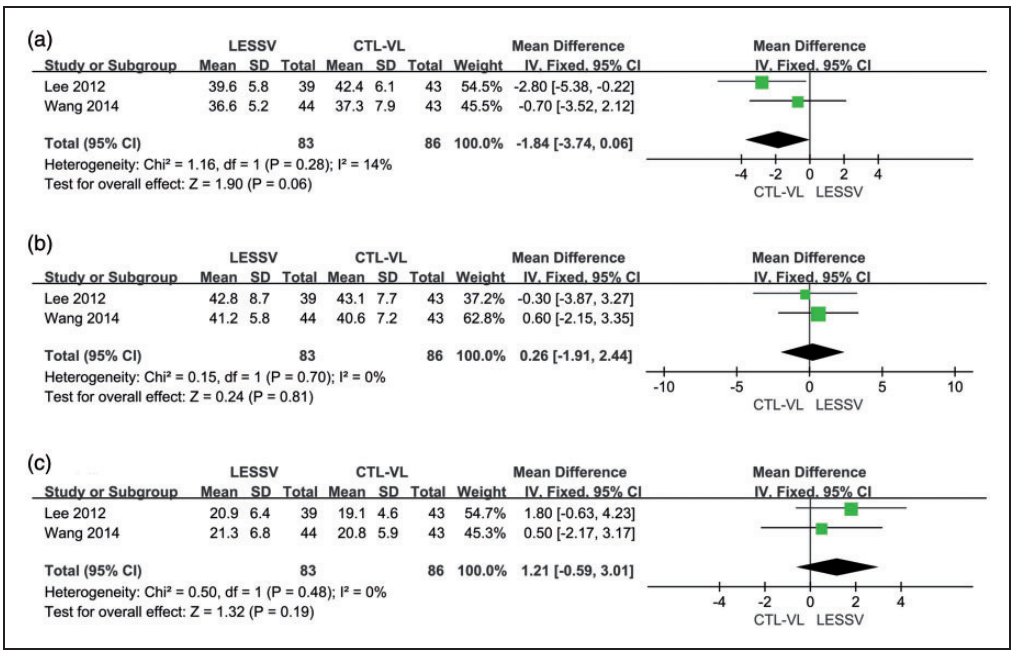

Figure 7. Forest plot of pooled analysis of data concerning semen quality: (a) semen count; (b) semen motility; (c) semen morphology.
LESSV, laparoendoscopic single-site surgery varicocelectomy; CTL-VL, conventional transperitoneal laparoscopic varicocele ligation; Fixed, fixed effects model; IV, inverse variance; CI, confidence intervals, df, degrees of freedom.

better than conventional varicocelectomy in terms of postoperative pain, time to return to normal activity and patients' satisfaction with the cosmetic appearance of their wound. Although the operating time was significantly longer in the LESSV group than in the conventional surgery group, there was no significant differences between the types of surgery in terms of hospital stay, semen quality or hydrocele complications.

Over the years, laparoscopy has gained extensive acceptance as the method of choice

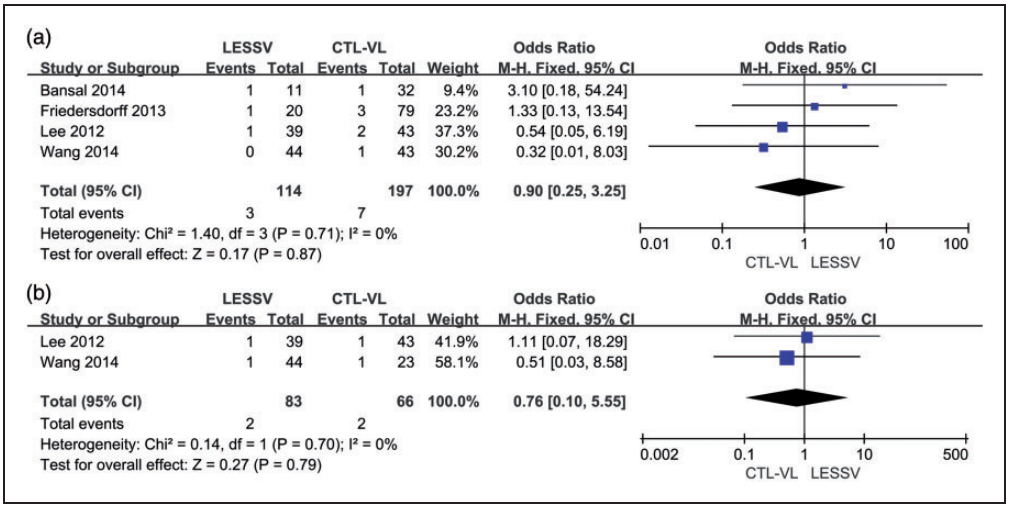

Figure 8. Forest plot of pooled analysis of data concerning hydrocele complications: (a) persistence of hydrocele; (b) recurrence of hydrocele.
LESSV, laparoendoscopic single-site surgery varicocelectomy; CTL-VL, conventional transperitoneal laparoscopic varicocele ligation; MH, Mantel–Haenszel test; Fixed, fixed effects model; CI, confidence intervals, df, degrees of freedom.

for the surgical treatment of various pathological entities in both children and adults.[15] Laparoscopic varicocelectomy allows for clear visualization of the surgical field and easy access to the surgical site with minimal dissection.[16] In addition, laparoscopic varicocelectomy has been shown to be well tolerated and particularly effective for patients with bilateral varicoceles.[4]

Recent advances in laparoscopy have focused on minimizing the number of incisions.[12] The LESS approach provides intracorporeal access while requiring only one incision, which can be hidden in the umbilicus. In addition, because only one trocar is used in the LESS approach, the likelihood of multiple trocar-associated pressure injuries that may cause postoperative pain at the incision site is reduced. Indeed, fewer incisions may lead to both a lower incidence of pain and port site infections, which in turn may lead to faster recovery when compared with traditional laparoscopic surgery.[12] Moreover, a better cosmetic result is achieved using a single incision with a well-hidden umbilical scar, making it a preferable option for young people.[14] The meta-analysis of data from the two studies that evaluated patient satisfaction with cosmetic results showed that satisfaction was greater with LESSV than with conventional varicocelectomy.[10,12]

The operating time was significantly longer in the LESSV group than in the conventional surgery group. Single port surgery involves a number of technical challenges that differ from those of classic laparoscopic techniques, including triangulation loss, a challenging work angle, limited instrumentation, difficulties with retraction, instrument overcrowding and crossing and a compromised line of vision.[14] However, all these difficulties may be overcome with training.[5]

There was no significant difference between the two surgical approaches in terms of semen quality improvement or complication rate. Therefore, LESSV and

conventional varicocelectomy achieved the same effects, indicating that LESSV is an efficient surgical technique that offers a beneficial outcome without risk of adverse effects.

This meta-analysis had some limitations in that only six studies were eligible for inclusion, and in some comparisons relevant data were only available from two studies. This may have reduced the reliability of the results and the addition of data from future comparative studies will help to confirm the meta-analysis findings.

In conclusion, LESSV was associated with less pain, a shorter recovery time and greater patient satisfaction with cosmetic outcome compared with CTL-VL. While the operating time was longer with LESSV than with CTL-VL, there was no difference between the two surgical approaches in terms of clinical effect, hospital stay or incidence of complications. Further studies with longer follow-up periods are required to substantiate these findings.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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