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A systematic review and meta-analysis of single-incision mini-slings (MiniArc) versus transobturator mid-urethral slings in surgical management of female stress urinary incontinence

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Abstract

Background: To assess the current evidence of effectiveness and safety of single-incision mini-slings (MiniArc) versus transobturator midurethral slings in the management of female stress urinary incontinence (SUI).

Methods: A systematic search was performed from the electronic databases including PubMed, EMBASE, and Cochrane Library by November 2017. Using RevMan5.3 statistical software, the primary outcomes including subject and objective cure rates at 6 to 24 months follow-up were evaluated. Meanwhile, analysis was also performed for comparing the secondary outcomes such as peri- and postoperative complications, operative data, and quality of life.

Results: Six randomized controlled trials (RCTs) and 6 retrospective cohort studies involving 1794 patients with SUI were analyzed based on the inclusion criteria. On the basis of our analysis, MiniArc was proven to have a noninferior clinical efficacy compared with transobturator midurethral slings with respect to the objective cure rate (risk ratio [RR] = 0.98, 95% confidence interval [CI] 0.94–1.03, $P = .43$) and subjective cure rate (RR = 0.97, 95% CI 0.91–1. 04, $P = .38$). In addition, pooled analysis showed that MiniArc had significantly lower postoperative pain scores (mean difference [MD] = −1.70, 95% CI −3.17 to −0.23, $P = .02$) and less postoperative groin pain (RR = 0.42, 95% CI 0.18–0.98, $P = .04$). Moreover, the MiniArc group also had a significantly shorter operation time (MD = −6.12, 95% CI −8.61 to −3.64, $P < .001$), less blood loss (MD = −16.67, 95% CI −26.29 to −7.05, $P < .001$), shorter in-patient stay (MD = 1.30, 95% CI −1.74 to −0.86, $P < .001$), and less urinary retention risk (RR = 1.15, 95% CI 0.46–2.87, $P = .77$). However, overall evidence was insufficient to suggest a statistically significant difference in the adverse event profile for MiniArc compared with transobturator slings.

Conclusions: This meta-analysis indicates that MiniArc is an effective method treating SUI. When compared with transobturator slings, it not only has a similar high cure rates, but also is associated with shorter operation time, less blood loss, more favorable recovery time, lower postoperative pain scores, less postoperative groin pain, less urinary retention, and absence of a visible wound. However, the findings of this study should be further confirmed by well-designed prospective RCTs with a larger patient series.

Abbreviations: CI = confidence interval, MD = mean difference, MUS = mid-urethral slings, QoL = quality of life, RCT = randomized controlled trial, RR = risk ratio, SIMS = single-incision mini-sling, SMD = standardized mean difference, SMUS = standard midurethral sling, SUI = stress urinary incontinence, TOT = transobturator route with outside-in, TVT-O = transobturator route with inside-out, UI = urinary incontinence.

Keywords: MiniArc, single-incision mini-sling, stress urinary incontinence, TOT, transobturator midurethral slings, TVT-O

1. Introduction

Stress urinary incontinence (SUI) is a common medical condition characterized by the involuntary leakage of urine with activity such as laughing, coughing, and sneezing, which affects 35% of adult women worldwide.[1,2] The pathogenesis of such disease is generally due to a mechanical abnormality or weakness in the urethra or pelvic floor support.[3] Initial management of SUI includes conservative treatment such as pelvic floor muscle training, and electrical stimulation with or without pharmacotherapy.[4] However, these kinds of conservative methods turned out to be less effective.[5] Then many types of surgery such as bladder neck suspension operations and anterior vaginal wall repair operations have been performed to treat women with SUI.[6,7] Some urologists also made many attempts such as using autologous fascia sling as an alternative method to mesh sling to treat SUI with pelvic organ prolapse.[8]

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However, the current evidence regarding the efficacy and safety of single-incision mini-sling (SIMS) is still controversial. In a recent published Cochrane systematic review and meta-analysis on effectiveness and complications of SIMS operations for SUI, it showed that SIMS had a higher risk of vaginal mesh exposure and more operative blood loss when compared with transobturator slings.[3] Nevertheless, most of these findings were derived from the trials involving TVT-Secur, which has been withdrawn from clinical use due to its poor clinical outcomes at the midterm follow-up.[9–12]

Therefore, additional evidence is needed to undertake any reasonable comparison of other SIMS versus transobturator slings. In recent years, more and more studies have showed MiniArc combined the advantage of high cure rate with a low complication rate, positive operative, and recovery results.[13,14] In this case, it is worth conducting a new systematic review and meta-analysis involving relevant available studies to date to evaluate the efficacy of MiniArc versus transobturator slings.

2. Materials and methods

To assess the clinical efficacy and safety of the MiniArc and transobturator midurethral slings (MUS), which could be further subdivided into 2 types as inside-out (TVT-O) and outside-in (TOT), a comprehensive literature search was performed using PubMed, EMBASE, and Cochrane Library in November 2017. Using the keywords "Single-incision mini-sling," "MiniArc," "transobturator mid-urethral slings," "TVT-O," "TOT," and "stress urinary incontinence" for articles. These search terms were used singly and combination. In addition, hand searches of the references and citation lists of all relevant reviews were performed. For the literature selection, the search strategy was applied based upon the Preferred Reporting Items for Systematic Reviews and Meta-analysis statement. Only studies comparing MiniArc with transobturator MUS were included. Relevant references cited from the selected papers were also retrieved. No language restriction was applied, and search criteria were limited to humans, adult females. Literature search, selection, and data extraction were undertaken by 2 reviewers (BJ and SL) independently and then cross-checked. Any differences at this stage are resolved through discussion, if necessary, by a majority decision of the reviewers. A flowchart showed that the number of literatures selected or exclude at each stage was presented in Fig. 1. Ethics committee approval for this study was not necessary because all the data was carefully extracted from existing literature, and this article was not involving handling of individual patient data.

2.1. Assessment of study quality

We evaluated the level of evidence for each selected article based on the criteria recommended by the Oxford Center for Evidence-Based Medicine.[15] As for methodological quality assessment, we use the Jadad scale[16] to assess the quality of randomized controlled trials (RCTs) and chose the Newcastle–Ottawa scale[17] to evaluate the Quality of retrospective cohort studies (Table 1).

Twelve relevant studies[18–29] including 1794 patients were selected for analysis. No differences were found in terms of age and the basic physical conditions between the MiniArc group and transobturator MUS group. Data were extracted independently by 2 authors (BJ and SL). We use the mean difference (MD) or

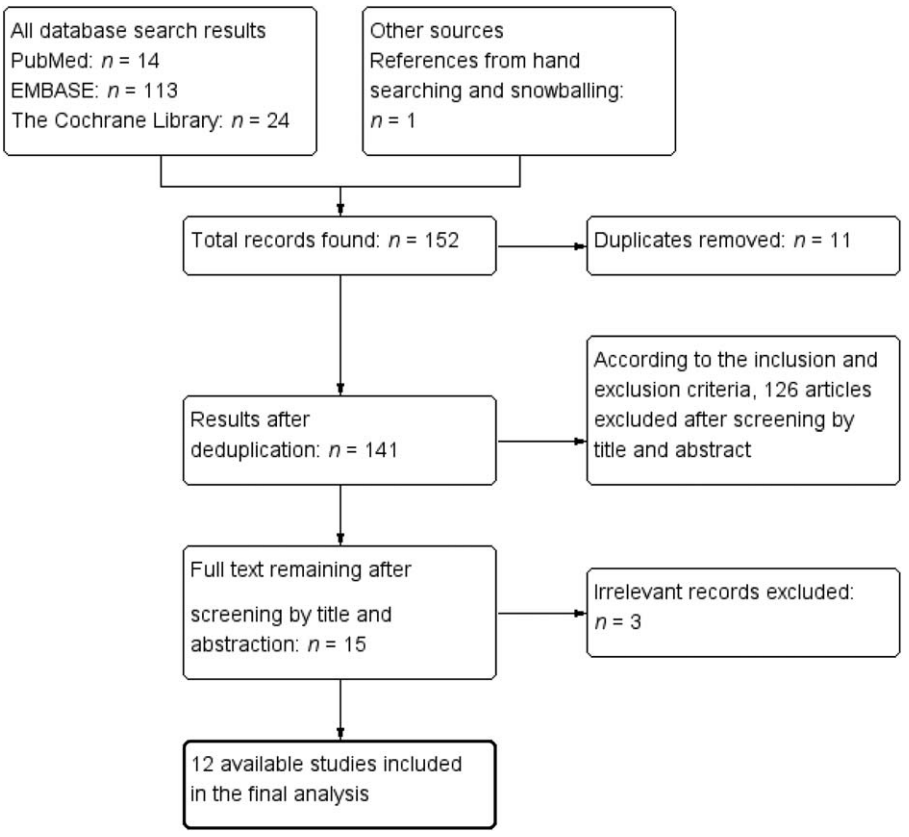

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-analysis flowchart.

Table 1

Summary of comparative studies included in meta-analysis.

Study	Country	Study period	Study design	LE	Intervention		Sample size		Follow-up	Study quality
					Trial	Control	Trial	Control		
Tieu 2016	USA	2008–2011	RCT	2a	MiniArc	Transobturator	49	49	1 y	3*
Schellart 2014	The Netherlands	2009–2011	RCT	2a	MiniArc	Transobturator	97	96	1 y	4*
Foote 2014	Australia	Not mention	RCT	2a	MiniArc	Transobturator	25	25	2 y	3*
Lee 2015	Australia	2009–2011	RCT	2a	MiniArc	Transobturator	112	113	6 mo	4*
Enzelsberger 2010	Germany	Not mention	RCT	2a	MiniArc	Transobturator	45	45	1 y	3*
Oliveira 2011	Portugal	2008	RCT	2a	MiniArc	Transobturator	30	30	1 y	4*
Castroviejo-Royo 2012	Spain	2005–2011	Retrospective cohort study	2b	MiniArc	Transobturator	103	214	1 y	7†
Tutolo 2016	Belgium	2003–2012	Retrospective cohort study	2b	MiniArc	Transobturator	166	215	1 y	7†
Lo 2014	China	2010–2011	Retrospective cohort study	2a	MiniArc	Transobturator	85	55	6 mo	7†
Sun 2012	China	2010–2011	Retrospective cohort study	2a	MiniArc	Transobturator	43	42	1 y	7†
Wu 2016	China	2005–2014	Retrospective cohort study	2a	MiniArc	Transobturator	54	68	1 y	7†
De Ridder 2010	Belgium	2007–2008	Retrospective cohort study	2b	MiniArc	Transobturator	75	56	1 y	9†

LE = level of evidence, RCT = randomized controlled trial.

* Using Jadad scale (score from 0 to 5).

† Using Newcastle–Ottawa Scale (score from 0 to 9).

standardized mean difference (SMD) to evaluate the continuous outcomes. For the studies that expressed continuous data as median and range values, we chose the statistical formula demonstrated by Hozo et al[30] to count the means and standard deviations. The results were expressed as risk ratio (RR) with a 95% confidence interval (CI) for dichotomous variables. The χ^2 and I^2 tests (I^2 >50% was regarded as substantial heterogeneity) were used to assess the heterogeneity of the study data. If heterogeneity was considered to be low, fixed-effects models were used for the meta-analyses. Otherwise, a random-effects model was used to reduce the effect of statistical heterogeneity. The pooled effects were determined by the z test and the P value <.05 was considered statistically significant. Moreover, in the comparisons of MiniArc and transobturator MUS, the relevant publications with appropriate data allowed us to perform subgroup analyses according to the device used. Thus, we differentiated MiniArc versus TVT-O, MiniArc versus TOT, and MiniArc versus other transobturator tapes (reporting studies where both TVT-O and TOT tapes were used without differentiating the results). For several comparisons, sensitivity analyses were used. The meta-analysis of comparable data was performed using Review Manager 5.3 software.

3. Results

3.1. Subjective and objective cure rate of incontinence

Four studies involving 552 participants were included to compare the objective cure rates of MiniArc and transobturator MUS. Due to no significant heterogeneity among these trials, the fixed-effects model was chosen for the statistical analysis (I^2 = 0). The overall results showed that the subjective cure rate of the 2 groups had no significant difference (RR = 0.97, 95% CI 0.91–1.04, P = .38) (Fig. 2A). With regard to the objective cure rate, a total of 5 studies were included to compare the 2 sling surgeries. Similarly, the pooled analysis showed no statistical significance

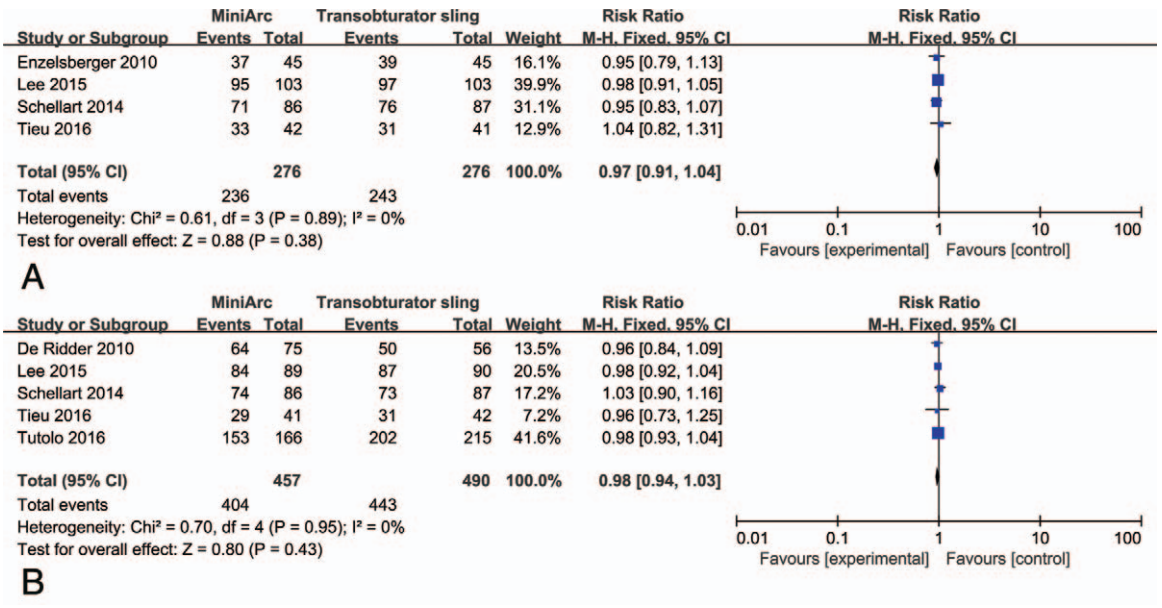

Figure 2. (A) Forest plot of the subjective cure rate. (B) Forest plot of the objective cure rate. 95% CI = 95% confidence interval, df = degrees of freedom, Fixed = fixed effects model, IV = inverse variance, SD = standard deviation.

Table 2

Study outcomes comparing MiniArc and Transobturator sling.

Outcomes	No. of studies	Sample size		Heterogeneity (total)				MD or RR (95% CI)	*P* (total)
		MiniArc	Transobturator	χ^2	df	I^2, %	*P*		
Objective cure rate	4	393	443	0.14	3	0	.99	0.98 (0.94, 1.03)	.48
Subjective cure rate	4	276	276	0.61	3	0	.89	0.97 (0.91, 1.04)	.38
Operation time	11	810	924	85.34	10	88	<.001	−6.12 (−8.61, −3.64)	<.001
Blood loss	7	519	551	30.71	6	80	<.001	−16.67 (−26.29, −7.05)	.0007
Urinary retention	6	418	512	0.54	5	0	.99	0.70 (0.50, 0.98)	.04
Repeat of continence Surgery	6	388	369	2.93	5	0	.71	1.15 (0.46, 2.87)	.77
Bladder perforation	6	575	685	0.57	3	0	.42	0.57 (0.20, 1.63)	.29
Urinary tract infection	5	359	464	2.09	4	0	.72	0.76 (0.39, 1.46)	.41
Postoperative groin pain	5	384	405	8.79	4	54	.07	0.42 (0.18, 0.98)	.04
Vaginal mesh erosion	5	474	585	3.76	3	20	.29	2.05 (0.87, 4.86)	.10
Postoperative pain	3	98	97	34.39	2	94	<.001	−1.70 (−3.17, −0.23)	.02
Hospitalization time	3	140	110	27.83	2	93	<.001	−1.3 (−1.74, 0.86)	<.001
De novo urgency	6	271	268	1.06	5	0	.96	0.64 (0.37, 1.11)	.11
Sexual function	2	103	117	0.11	1	0	.74	4.42 (0.5, 39.39)	.18

CI = confidence interval, MD = mean difference, RR = risk ratio.

between the groups (RR = 0.98, 95% CI 0.94–1.03, *P* = .43) (Fig. 2B; Table 2).

3.2. Operative data

3.2.1. Operation duration. There were 11 trials which met the inclusion criteria. Nine trials compared MiniArc versus TOT and 1 trial compared MiniArc versus TVT-O. And 1 trial compared mixed transobturator slings group. The overall operation time was about 6 min less for MiniArc slings (MD = −6.12, 95% CI −8.61 to −3.64, *P* < .001) (Fig. 3A). However, evidence of some statistical heterogeneity cannot be ignored ($I^2 = 87$). Therefore, a sensitivity analysis was performed and little difference was found in the results (MD = −6.57, 95% CI −8.75 to −4.40, *P* < .001) (Fig. 3B).

3.2.2. Operative blood loss. Seven studies reporting this outcome in comparing MiniArc slings against transobturator slings (5 TOT, 1 TVT-O, and 1 mixed transobturator slings groups) were included in the meta-analysis. In the study conducted by Wu et al,[29] the data of those 2 transobturator slings were combined for the purpose of analysis. Thus, a subgroup analysis was necessary (MD = −16.67, 95% CI −26.29 to −7.05, *P* < .001) (Fig. 4A). While a sensitivity analysis suggested that had little impact on the combined result, the overall result was statistically significant supporting MiniArc slings (MD = −19.72, 95% CI −28.84 to −10.59, *P* < .001) (Fig. 4B).

3.2.3. Hospitalization time. Regarding the length of in-patient stay, only 2 studies were included in this meta-analysis (1 TOT and 1 mixed transobturator slings groups). When pooled, the result showed that the MiniArc group had a significantly shorter hospitalization time (MD = 1.30, 95% CI −1.74 to −0.86, *P* < .001) (Fig. 5).

3.2.4. Postoperative pain or discomfort. For this outcome, a total of 3 studies including 238 participants met the inclusion criteria. One trial compared MiniArc versus TOT and 2 trails compared MiniArc versus inside-out transobturator slings TVT-O. According to our analysis, the combined result was still statistically significant in favor of MiniArc slings (MD = −1.70, 95% CI −3.17 to −0.23, *P* = .02) (Fig. 6A). Though some statistical heterogeneity did exist, the direction of effect was the same in all studies. The sensitivity analysis is also in favor of MiniArc (MD = −0.84, 95% CI −1.62 to −0.07, *P* = .03) (Fig. 6B).

3.3. Adverse events

3.3.1. Long-term postoperative groin pain. With the aim of detecting the long-term postoperative groin pain, 5 studies were used for the statistical analysis. Four trials compared MiniArc versus TOT. The overall result was not statistically significant. One trail compared MiniArc versus TVT-O, but the result was not statistically significant. Overall, the combined result showed that MiniArc group had less postoperative groin pain (RR = 0.42, 95% CI 0.18–0.98, *P* = .04) (Fig. 7), but with a degree of heterogeneity ($I^2 = 54\%$).

3.3.2. Urinary retention. This outcome was reported in 6 studies, all of which compared MiniArc against transobturator slings (4 TOT, 1 TVT-O, and 1 combined groups). A total of 98 events were reported among those 930 participants. On the basis of our analysis, no heterogeneity was found among the trials ($I^2 = 0$), and the combined overall result showed MiniArc had a lower risk of urinary retention (RR = 0.70, 95% CI 0.50–0.98, *P* = .04) (Fig. 8).

3.3.3. Repeated stress incontinence surgery. With regard to repeated stress incontinence surgery, 6 studies comparing MiniArc slings against transobturator slings (5 TOT and 1 TVT-O groups) were included. Eventually, 19 events were reported among those 757 participants. Pooled analysis revealed that there was no significant difference in the incidence rate of repeated surgery between these 2 groups (RR = 1.15, 95% CI 0.46–2.87, *P* = .77) (Fig. 9).

3.3.4. Bladder perforation. Very few events of bladder perforation were reported in 4 studies that compared MiniArc versus transobturator slings. The overall results were not statistically significant (RR = 0.57, 95% CI 0.20–1.63, *P* = .29) (Fig. 10).

3.3.5. De novo urgency. Three trials were included in the meta-analysis comparing MiniArc against TOT. Overall no statistically significant difference between the groups was observed. This outcome was also reported in 1 trial that compared MiniArc

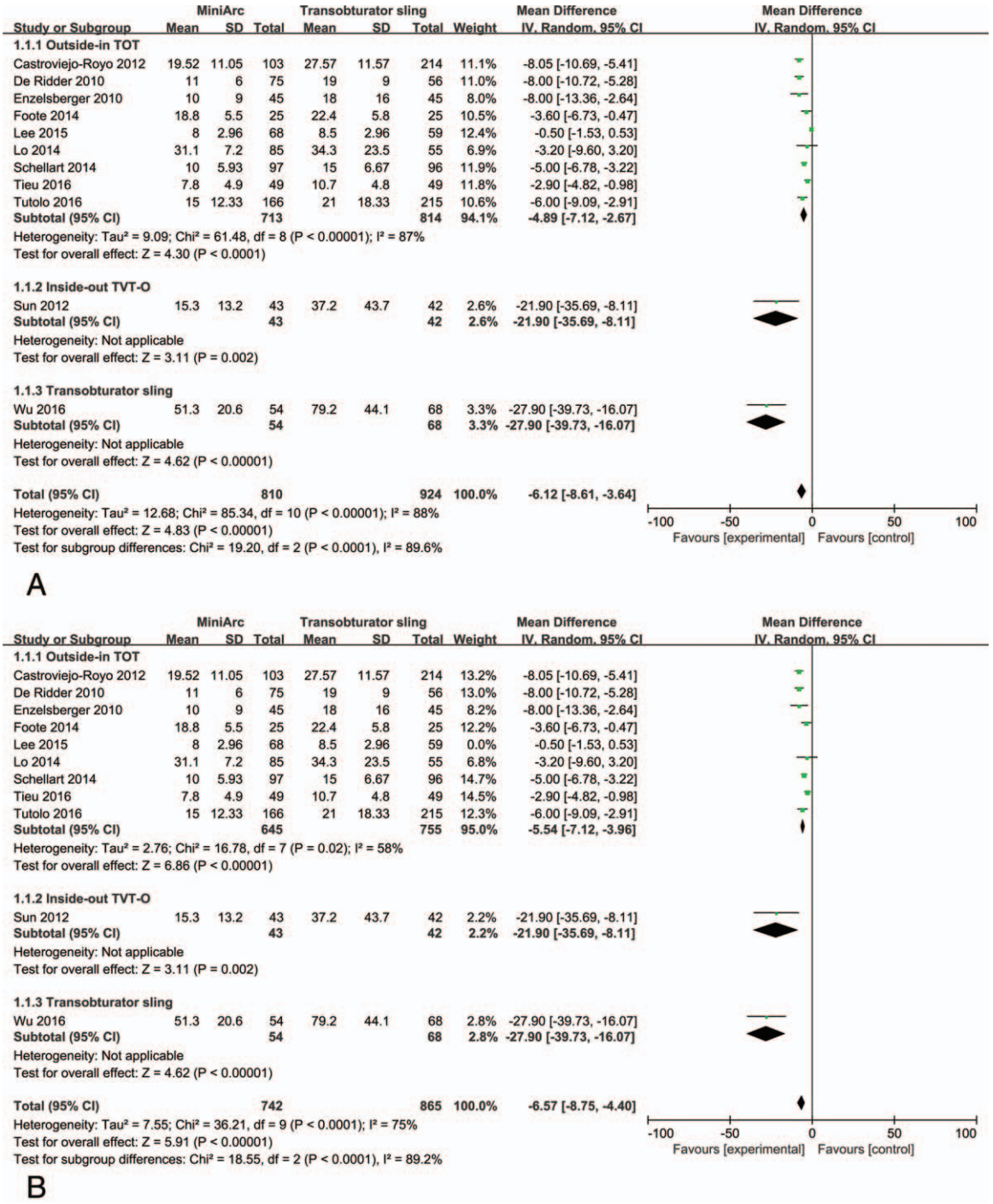

Figure 3. (A) Forest plot of the operation time. (B) Forest plot of the sensitivity analysis of the operation time. 95% CI = 95% confidence interval, df = degrees of freedom, IV = inverse variance, Random = random-effects model, SD = standard deviation.

versus TVT-O and in one versus mixed transobturator slings group. Again, there was no statistically significant difference between the groups. The combined result implying that evidence was insufficient to suggest any difference (RR = 0.64, 95% CI 0.37–1.11, $P = .11$) (Fig. 11).

3.3.6. Urinary tract infection. As to the urinary infection related to the use of synthetic mesh, 5 trials including 823 participants were recruited in our analysis. According to our analysis, pooled analysis verified that there was no significant difference between the 2 groups (RR = 0.76, 95% CI 0.39–1.46, $P = .41$) (Fig. 12).

3.3.7. Vaginal mesh erosion. This rare outcome was reported in 5 trials that compared MiniArc versus transobturator slings (10/474, 2.1% vs. 7/585, 1.2%). On the basis of our analysis, low heterogeneity was found among the trials ($I^2 = 20$), and thus, a fixed-effects model was selected. When pooled, the result showed that there is no significant difference in the incidence rate of

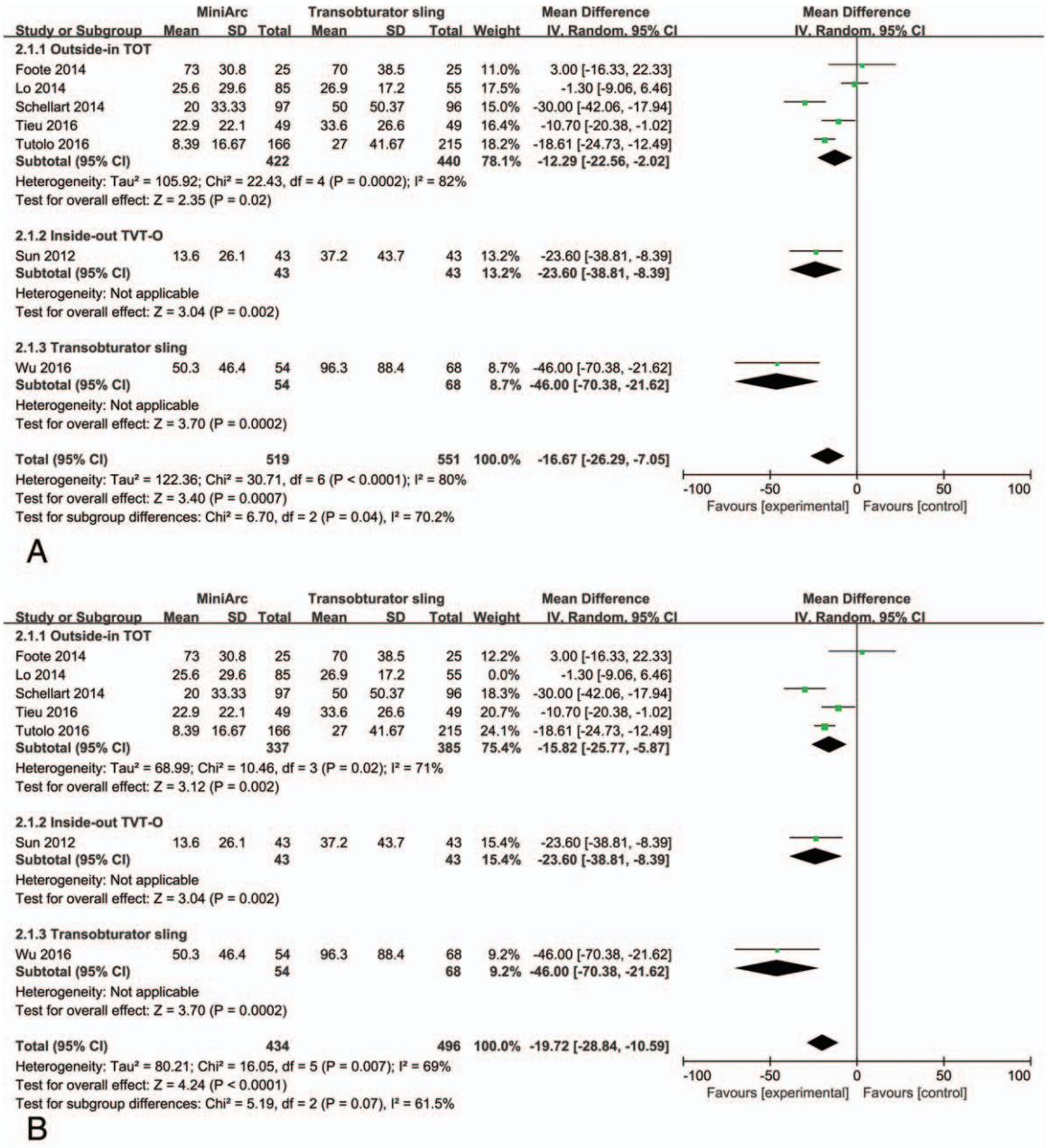

Figure 4. (A) Forest plot of the blood loss. (B) Forest plot of the sensitivity analysis of the blood loss. 95% CI = 95% confidence interval, df = degrees of freedom, IV = inverse variance, Random = random-effects model, SD = standard deviation.

erosion between the 2 groups (RR = 2.05, 95% CI 0.87–4.86, $P = .10$) (Fig. 13).

3.3.8. Quality of life and sexual function. Though a total of 5 trails reported quality of life (QoL) changes, meta-analysis was not possible for all these trails because different condition-specific health questionnaires were used, such as International Consultation on Urinary Incontinence Sexual Questionnaire-12, Incontinence Questionnaire, and Incontinence Impact Questionnaire.

Two studies were chosen for the statistical analysis of sexual function. The results show that there is no significant difference in the incidence rate of the sexual function between the 2 groups (RR = 4.42, 95% CI 0.50–39.39, $P > .05$) (Fig. 14).

4. Discussion

Urinary incontinence (UI) is an important health problem resulting in psychological, social, and hygienic impairment, which affects our normal QoL a lot.[31] In clinical practice, it can be classified mostly into 3 types: SUI, urge UI, and mixed UI.[3,31] For the SUI, the most common type of UI, leakage is due to insufficient pressure of urethra closure when exertion raises intra-abdominal pressure.[1,3,32] And the lack of urethral closure pressure always results from anatomic changes in the bladder and urethra and muscles.[32] To solve this annoying problem, standard midurethral sling (SMUS) was presented as the most effective treatment when the conservation measures failed.

It is reasonable to classify SMUS into 3 generations. In 1995, Ulmsten[33] introduced retropubic tension-free placement of an

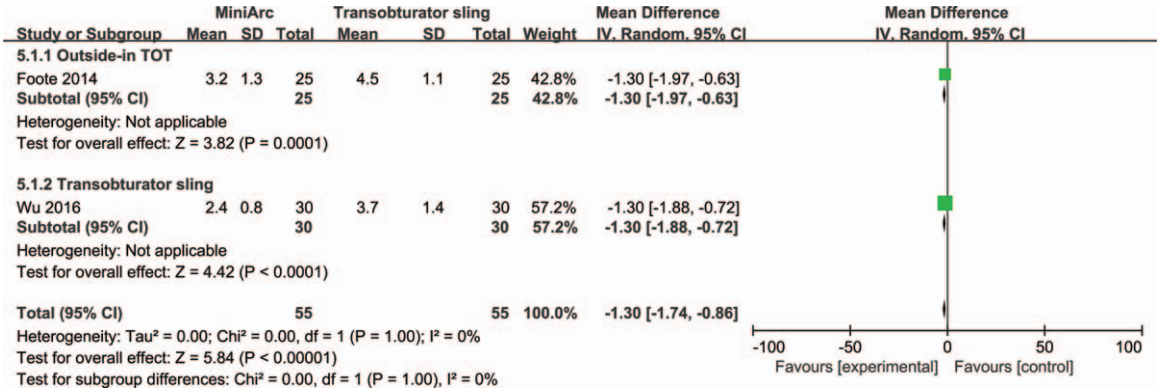

Figure 5. Forest plot of the hospitalization time. 95% CI = 95% confidence interval, df = degrees of freedom, IV = inverse variance, Random = random-effects model, SD = standard deviation.

alloplastic sling (TVT) as the first generation, which was considered as the first-line therapy at that time. Although this method had achieved effective results, complications such as bladder perforation have led to continued searching for other sling methods.[34] In 2001, Delorme used the "outside-in" technique (TOT) of a transobturator route for suburethral tape placement.[35,36] Later a new approach, the "inside-out" technique (TVT-O) was described and introduced by De Leval.[37] Both these method were then considered as the second generation. The TOT and TVT-O procedures proved to have high success rates in short- and medium-term follow-ups.[38] However, these methods might injury the obturator nerve and blood vessels when the device passes through the obturator. In addition, the incidence of postoperative groin and thigh pain

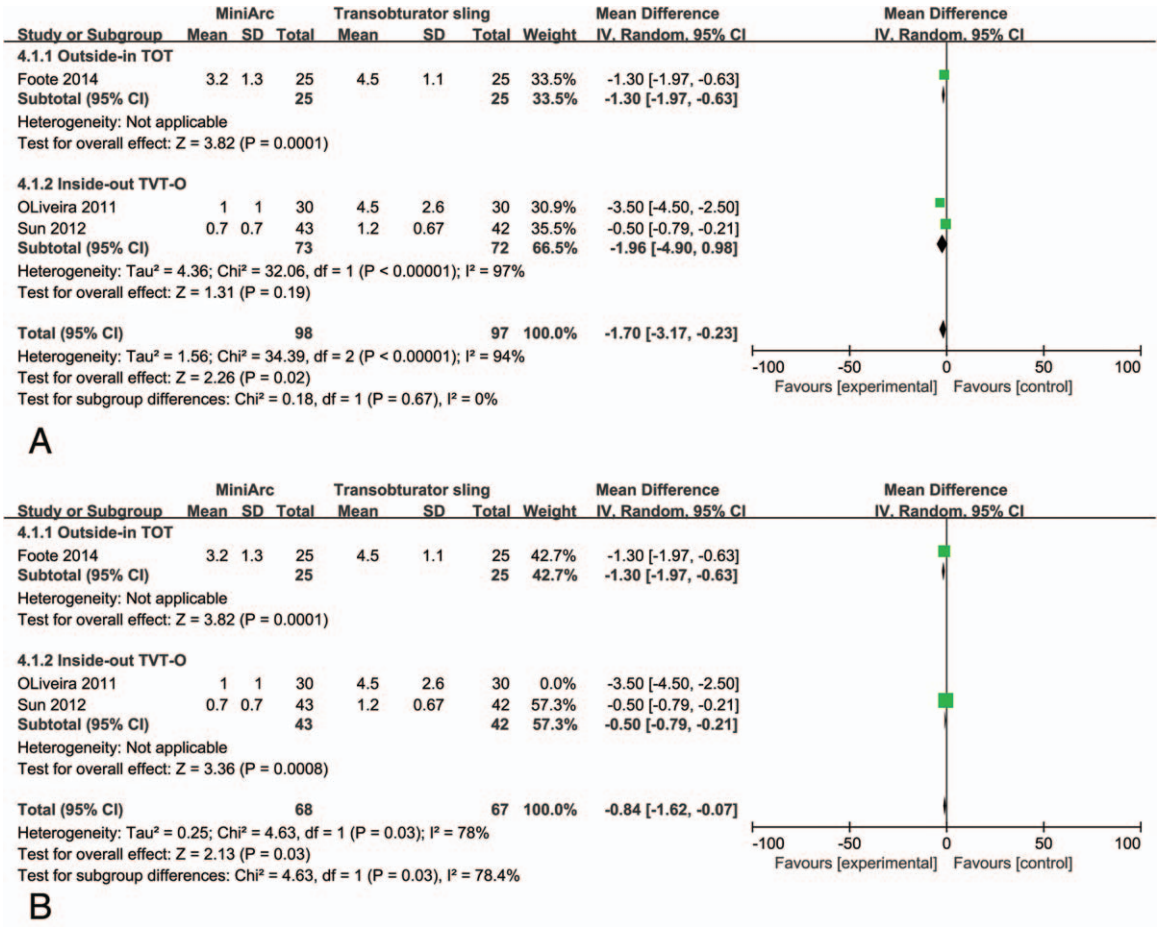

Figure 6. (A) Forest plot of the postoperative pain. (B) Forest plot of the sensitivity analysis of the postoperative pain or discomfort. 95% CI = 95% confidence interval, df = degrees of freedom, IV = inverse variance, Random = random-effects model, SD = standard deviation.

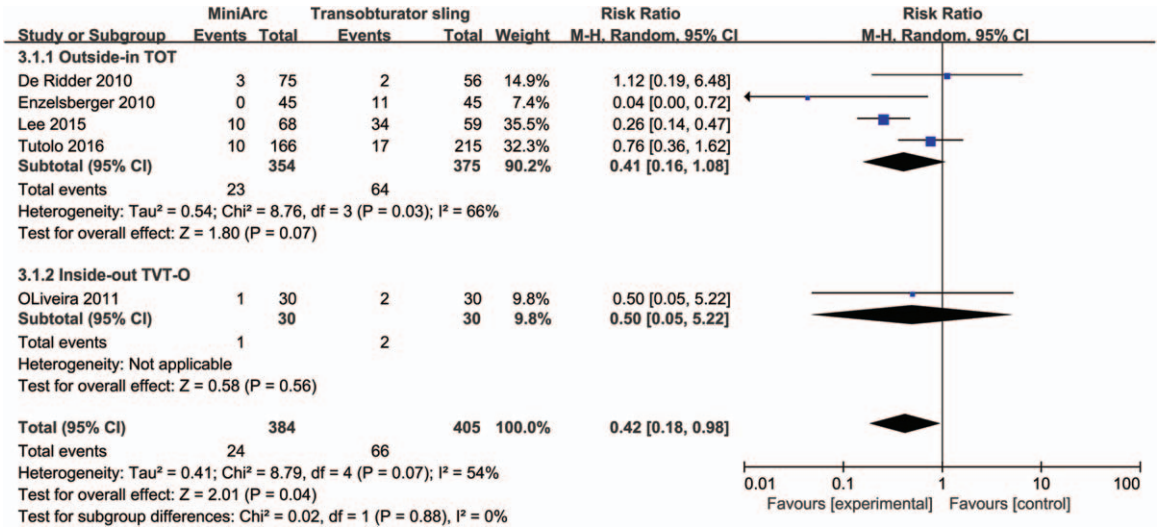

Figure 7. Forest plot of the postoperative groin pain. 95% CI = 95% confidence interval, df = degrees of freedom, IV = inverse variance, Random = random-effects model, SD = standard deviation.

increased as the device pass through the adductor tendons and skin.[39] With the aim of reducing the invasiveness of the tape procedures and limit the risk of postoperative groin pain and injury, the third-generation SMUS, most commonly described as SIMS, was applied to practice.

Hence, the MiniArc SIMS, which was designed with self-fixating tips that does not require the needle to pass through the obturator foramen or external skin incision,[21] attracted a lot attention due to its positive clinical efficacy.

The MiniArc sling fundamentally differs from SMUS because it has a shorter trajectory of insertion and therefore need a robust anchoring mechanism to the obturator complex with a strong postinsertion pullout force. Moore et al[40] once revealed that it had a strong pullout force which was 4 times the normal pelvic floor strain.

Theoretically, when considering the cure rates, which critically depended on how tight the sling was applied, the MiniArc group should have a superior subjective and objective clinical outcome due to its power tensioning of the sling. However, the conclusions were not consistent across studies. Variable success rates for MiniArc have been reported, from 69% to 91%.[1] In an earlier meta-analysis in 2011, the investigators reported that MiniArc has even an inferior subject and objective cure rate when compared with MUS.[41] While according to a time-to-event

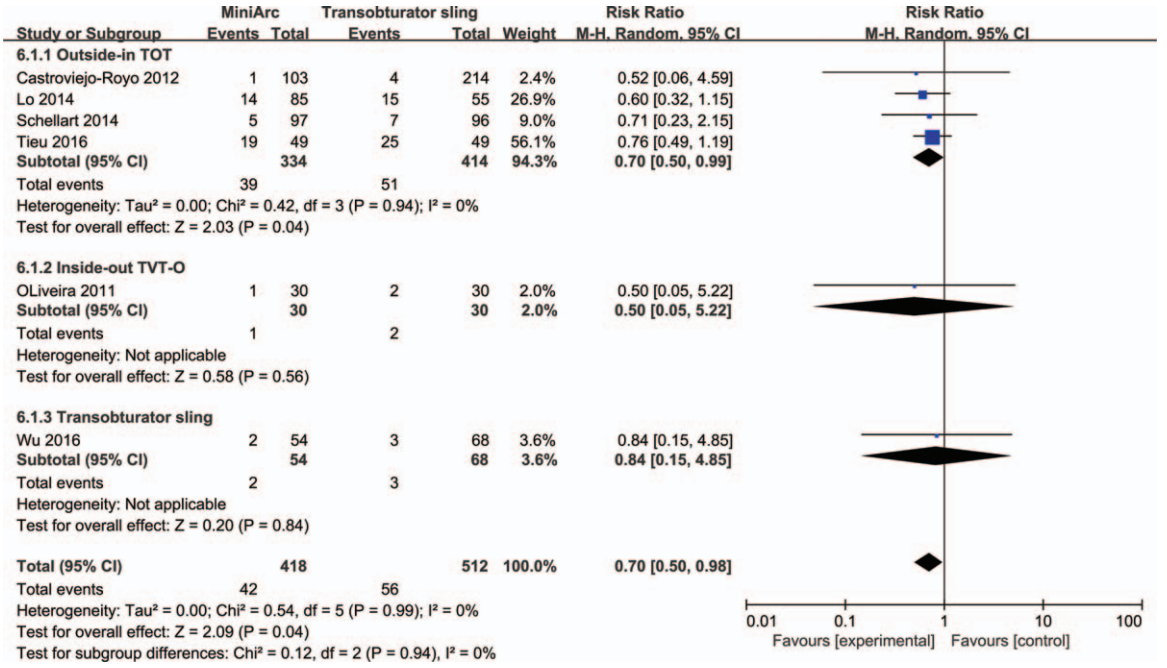

Figure 8. Forest plot of the urinary retention. 95% CI = 95% confidence interval, df = degrees of freedom, IV = inverse variance, Random = random-effects model, SD = standard deviation.

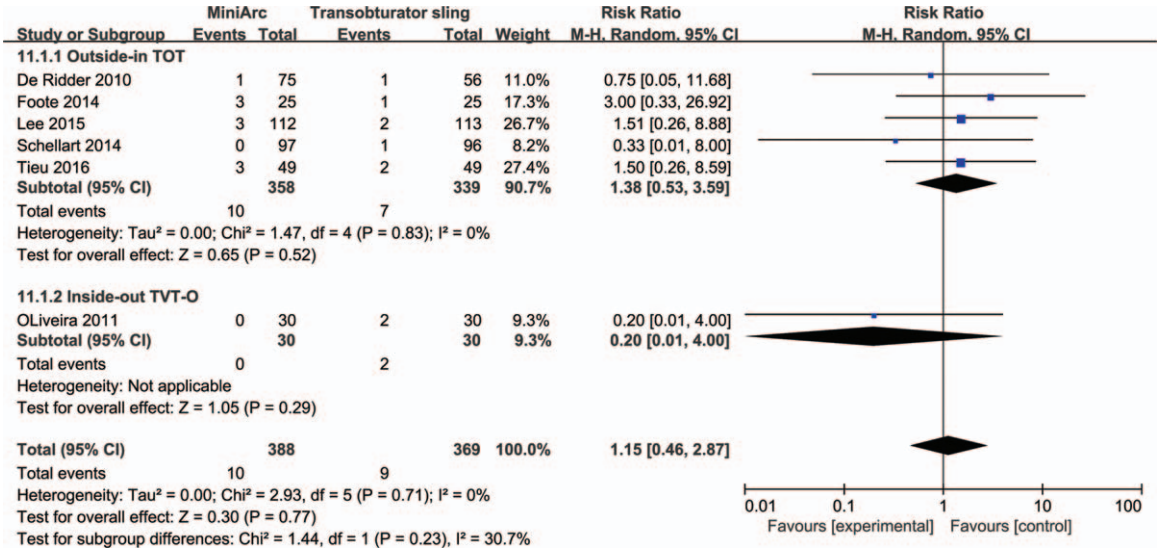

Figure 9. Forest plot of the repeat stress incontinence surgery. 95% CI = 95% confidence interval, df = degrees of freedom, IV = inverse variance, Random = random-effects model, SD = standard deviation.

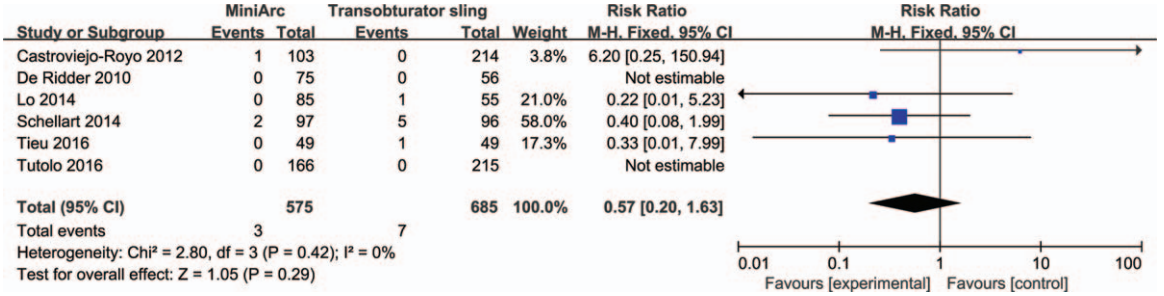

Figure 10. Forest plot of the bladder perforation. 95% CI = 95% confidence interval, df = degrees of freedom, Fixed = fixed-effects model, IV = inverse variance, SD = standard deviation.

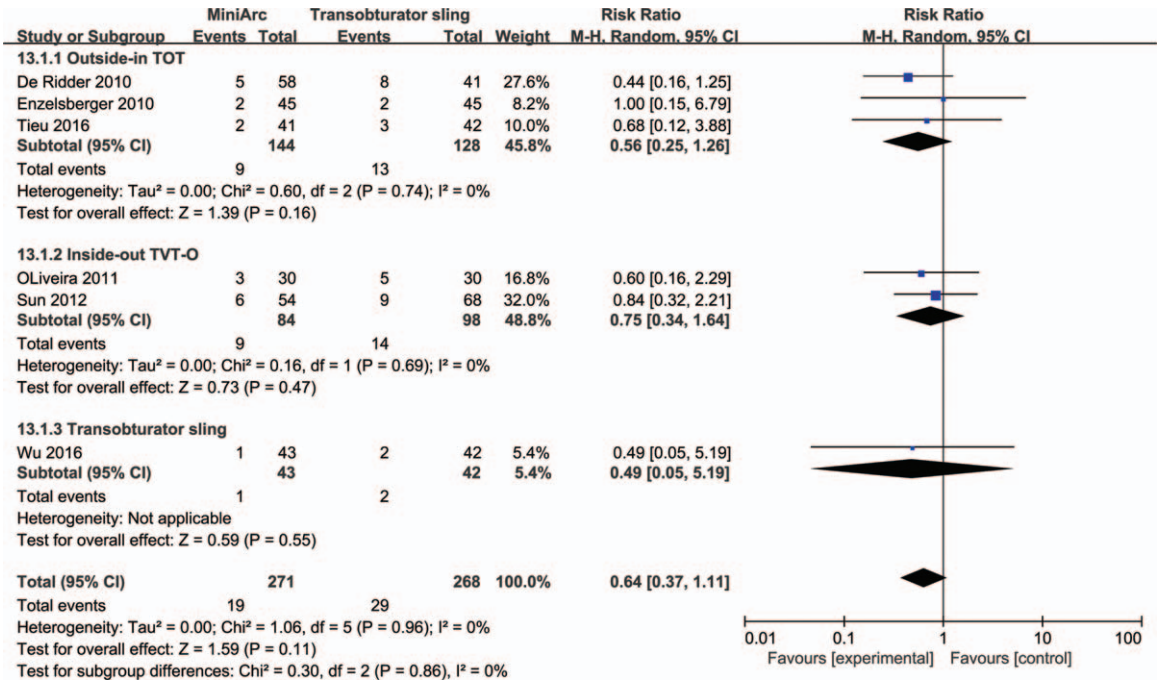

Figure 11. Forest plot of the de novo urgency. 95% CI = 95% confidence interval, df = degrees of freedom, IV = inverse variance, Random = random-effects model, SD = standard deviation.

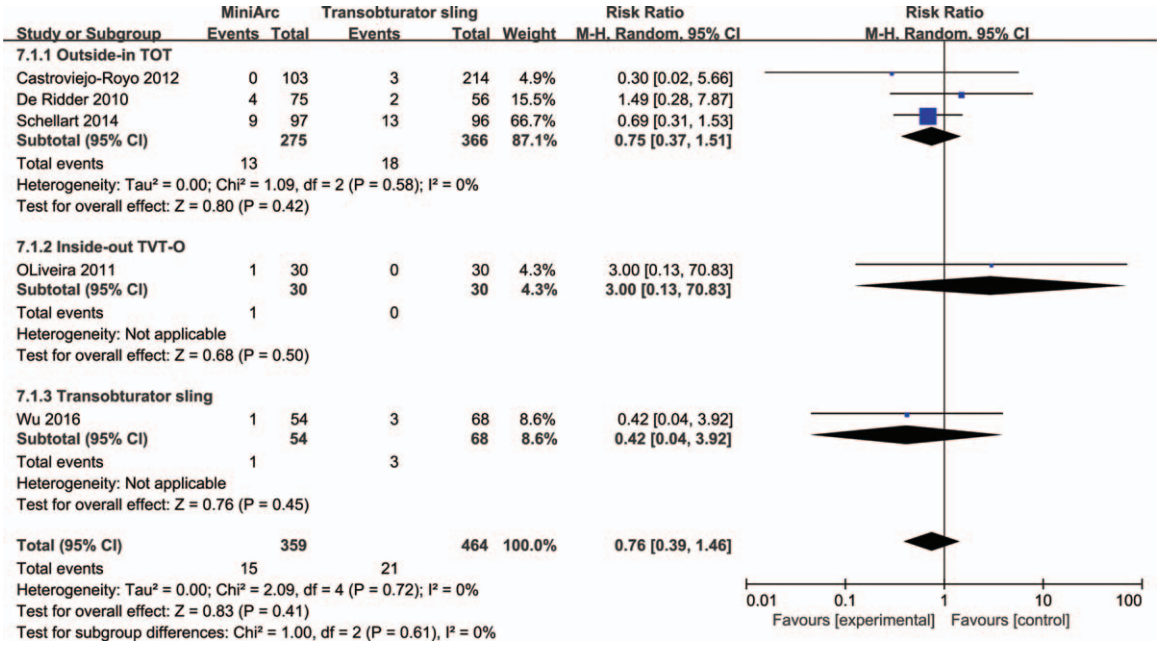

Figure 12. Forest plot of the urinary tract infection. 95% CI = 95% confidence interval, df = degrees of freedom, IV = inverse variance, Random = random-effects model, SD = standard deviation.

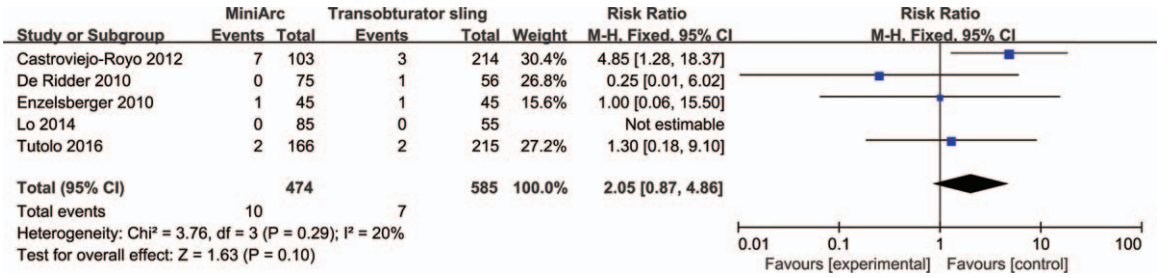

Figure 13. Forest plot of the vaginal mesh erosion. 95% CI = 95% confidence interval, df = degrees of freedom, Fixed = fixed-effects model, IV = inverse variance, SD = standard deviation.

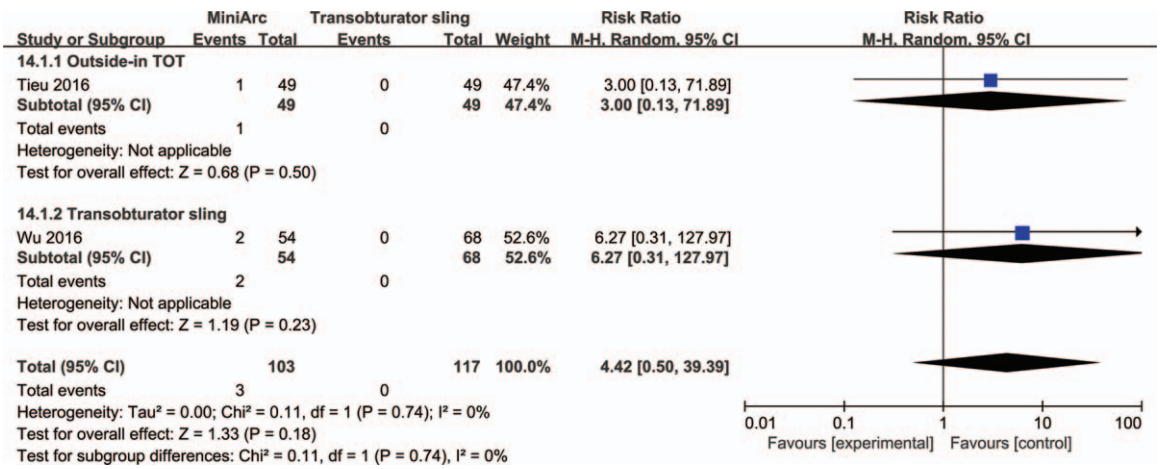

Figure 14. Forest plot of the sexual function. 95% CI = 95% confidence interval, df = degrees of freedom, Fixed = fixed-effects model, IV = inverse variance, SD = standard deviation.

analysis conducted by Tutolo et al[18] at 1-, 3-, and 5-year follow-up, MiniArc showed similar cure rate at 5 years compared with MonArc (89% vs. 87%, $P = .64$). In this case, we performed that this meta-analysis and the pooled analysis revealed no significant difference in subject and object cure rate between the MiniArc and transobturator sling groups, which means MiniArc is an effective methods treating SUI.

But why did the conclusion vary to each investigator? After consulting relative literatures, the reason may be associated with the following factors. First, the lack of force of the anchoring mechanism to the obturator membrane or muscles may be attributed to the failure,[41] though the sling had a 4 times stronger pullout force than the normal pelvic floor strain.[40] An animal study revealed that the anchoring mechanism was relatively weak compared with other SIMS.[42] A cadaveric study also showed that the obturator membrane alone, or the obturator muscle, was weak for the anchor to fix. The author suggested that anchors should be placed through the fascia, muscle, and membrane to ensure the highest possible retention force.[43] Second, the surgical technique and the inappropriate tension of the mesh might account for the poorer success rate.[20] The maintains should be left abutting the urethra, making the peri-urethral tissues to protrude through the mesh orifices slightly to get the ideal tension of the mesh.[44] However, no standard objective method was recommended to measure the sling tensioning at present. Therefore, it was difficult to assess and compare. Third, the learning curve and the surgical experience of each operator might make a difference.

Meanwhile, this meta-analysis showed that there were less urinary retention events occurring in MiniArc. This validated our hypotheses indirectly that the tension of the sling in MiniArc is not as powerful as we imagine. But the difference between the 2 technologies is not very significant.

In this meta-analysis, the previous published results in terms of favorable operative and recovery outcomes associated with MiniArc were also confirmed. Pooled data revealing that the overall operation time was about 6 min shorter for MiniArc slings. In addition, the combined result showed that the MiniArc group also had a significantly lower postoperative pain and less postoperative groin and less blood loss. These differences may partly be explained by the different technique procedures. Though MiniArc had a similar operation procedure perforating the obturator internus muscle and the foramen obturatum, it did not perforate the adductor muscles and the tape not lying approximate to peripheral branches of the obturator nerve. Moreover, MiniArc did not require incision in the inner side of the thigh, thus it reduces the risk of the injuries of blood vessel and nerve.[19,45,46]

Theoretically, less invasive and lower pain scores related to faster return to normal daily activities. This was in line with both the previous studies and our present analysis. Pooled results showed a statistically significant 1.3 days earlier return to normal activities with MiniArc group (MD = −1.30, 95% CI −1.74 to −0.86, $P < .001$). This outcome potentially supported the idea of the single-incision slings may be more cost-effective.[47] Nevertheless, Meta-analysis was not possible because no trails reported the economic evaluation directly between the 2 groups. Thus more high-quality studies concerning this problem are required.

Regarding the QoL, though all the 6 trails reported improvement in this outcome at the follow-up compared with baseline, meta-analysis was not possible due to different condition-specific health questionnaires used in each trail. Fortunately, there were 2 studies described the impact on sexual functions. According to our meta-analysis, pooling data identified that both the techniques had little impact on the sexual functions.

With respect to the complications such as repeat of continence surgery, perforation, erosion, or urinary tract infection, the data reported here seemed to suggest that there was no significant difference between the 2 operation methods.

Our meta-analysis, which was performed using the currently available comparative trails, however, has some limitations. On the one hand, 6 retrospective cohort studies eventually included into our analysis and the included RCTs did not describe the blinding methods and detailed randomization concealment. On the other hand, heterogeneity among these trails was found to be high with respect to several parameters. These parameters can be explained by the difference in outcome definitions and measurement. However, our study provided the most up-to-date information about the comparison between MiniArc and transobturator slings in surgical management of SUI. Further larger, well-designed prospective RCTs with a larger patient series are warranted to confirm the effect and mechanisms. Finally, only a small number of studies were identified thorough the systematic review of the literature and then enrolled in our meta-analysis.

5. Conclusions

This meta-analysis indicates that MiniArc is an effective method treating SUI. When compared with transobturator slings, it not only had a similar high cure rates, but also associated with lower complications. However, further larger, well-designed prospective RCTs with a larger patient series are required to confirm this conclusion.

Author contributions

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