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RESEARCH ARTICLE

Comparative Sexual Outcomes of Laparoscopic Davydov and SIS Graft for Neovagina in MRKH Patients: Meta-Analysis

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Abstract

Introduction: Mayer-Rokitansky-Küster-Hauser (MRKH) syndrome is a rare congenital anomaly of the female reproductive system, characterized by the absence of the uterus and upper vagina. Neovaginal reconstruction is the primary treatment to enable normal sexual function. Two commonly used techniques are the laparoscopic Davydov procedure and the use of Small Intestine Submucosa (SIS) grafts.

Methods: A systematic review and meta-analysis were conducted on studies comparing these two surgical techniques in MRKH patients. Literature searches were performed through multiple international databases. Inclusion criteria involved both observational and experimental studies reporting anatomical and sexual function outcomes postoperatively. Statistical analysis was performed to compare the outcomes of both techniques.

Results: The review found that both techniques are effective in achieving satisfactory anatomical and functional neovagina creation. However, differences were observed in parameters such as duration of molding use, vaginal length, and FSFI domain scores. The laparoscopic Davydov procedure showed advantages in anatomical outcomes and shorter molding duration, while SIS grafts demonstrated better scores in some subjective aspects of sexual function.

Conclusion: Both the laparoscopic Davydov procedure and SIS grafts are effective in neovagina creation for MRKH patients. The Davydov technique offers superior anatomical results and reduced postoperative dilation time, whereas SIS grafts may provide improved sexual desire, arousal, and satisfaction. Further studies with larger and more diverse populations are needed to validate these findings.

Keywords: MRKH, neovaginal reconstruction, laparoscopic davydov procedure, female sexual function index (FSFI)

INTRODUCTION

Mayer-Rokitansky-Kuster-Hauser syndrome (MRKH), also referred to as Müllerian aplasia or congenital absence of the uterus and vagina, is a rare congenital anomaly characterized by agenesis or aplasia of the uterus and upper part of the vagina in females with a normal chromosomal karyotype. External genitalia may appear normal, and patients usually have normal reproductive and endocrine function. Usually, patients present with primary amenorrhea during adolescence.¹ MRKH syndrome can be divided into 2 types. Type I stands for MRKH, which has a typical, isolated agenesis or hypogenesis of the Müllerian ducts. Type II MRKH stands for MRKH that has an atypical presentation, combined with extragenital malformation, including renal, skeletal, cardiac, neurologic, and other rare malformations.² Globally, MRKH affects approximately 1 in 4,500 to 5,000 females. 3 in China, approximately 140.000 patients have MRKH. In a previous study conducted in China, 69.6% classified as type I MRKH, and 30.4% classified as type II MRKH.² In Indonesia, the number of MRKH cases is still limited.

The treatment of choice for MRKH patients is the creation of a vagina. There are several approaches that can be used for creating a neovagina, including non-surgical and surgical approaches.^{4,5} Surgical approach that is commonly used because it has a relatively simple and safe procedure, the laparoscopic Davydov technique. The procedure involves the patients' own peritoneum for epithelization of the neovagina, thus it can react almost normally to hormonal changes and have a sexual excitation like normal vaginal tissue.^{5,6} One of the proposed new methods is to create a neovagina using the small intestine or part of the colon. The advantages of this method are that it doesn't require patients to use a dilator for a long time, unlike the laparoscopic Davydov procedure, which requires the use of a dilator for a long time for having sexual intercourse.^{5,6} This paper aims to assess the impact of two different surgical modalities (laparoscopic Davydog and Small Intestine Submucosa Graft) on the patient's sexual function, duration of moulding use, and total vaginal length after surgery in order to answer the gaps of knowledge in the effect of treatment modalities on the patient's sexual function.

METHODS

Search Strategy

Database searching was conducted in January 2025 using three separate databases (Scopus, Scholar, and PubMed). The keyword used in the literature search was discussed and finalized by all contributors via virtual meetings. Literature searches were conducted by all authors separately. Keywords that used for literature searching is “(“MRKH” OR “Mayer-Rokitansky-Kuster-Hauser”) AND (“Laparoscopic” OR “neovagina” OR “Davydov”) AND (“Small Intestine” OR “neovagina”) AND (“Sexual Function” OR “FSFI”)”.

FSFI (Female Sexual Function Index)

FSFI is one of the most common questionnaires used for assessing female sexual function. Consisting of 6 domains with 19 questions, FSFI evaluates key dimensions of female sexual function.

Developed in 2000 by Rosen et al, the 6 domains include desire, sexual arousal, lubrication, orgasm, satisfaction, and pain. FSFI is calculated by multiplying each domain factor by the score. Questions number 1 and 2 scored as 1 to 5, questions number 2 to 19 scored as 0 to 5. Total score ranges between 2 and 36; the higher the score, the better the level of sexual function.^{7,8}

Eligibility Criteria

Inclusion criteria of the systematic review are : (a) Study written in English or Indonesian, (b) article published from 2010-2025, (c) female with MRKH syndrome as a diagnosis, (d) studies involving Surgery as a treatment, (e) using Modified Davydov and SIS techniques, (f) assessing sexual function using FSFI. Exclusion criteria are (a) not using surgical intervention, (b) a full paper of the abstract that is not available.

Screening Procedure

All of the authors are screening the articles independently (WO & TP). All results are first pooled and screened for duplicates. After that, the eligibility criteria are used to select the articles resulting in study that is included in this review. If there is a disagreement on selecting the articles, the first author has autonomy in making decisions. Final steps is searching for the full-text availability, resulting in the article that is ready to be synthesized.

Risk of Bias Assessment

Risk of bias was assessed based on the types of studies included. The study without a randomization design was assessed using the ROBINS-I and Newcastle-Ottawa Quality Assessment Scale. The study with an RCT design was assessed by the RoB 2 tool. The analysis was performed independently by two authors. Conclusion from the assessment divided into three groups: "Low Risk", "Some concerns", and "High Risk". The results are presented in a graphical form (traffic light plot and summary plot).^{9,10}

Data Extraction and Meta-analysis

The synthesized data include the author's name, year of publication, sample size, duration of mold use, and total and domain scores for FSFI in both groups. Data are presented in mean and standard deviation. Meta-analysis was performed using RevMan 5.0, with standardized mean differences calculated from the mean, standard deviation, and sample size. The meta-analysis data is presented as a forest plot diagram. The systematic review's outcomes included the duration of molding use and postoperative vaginal length for each group.

Ethical Approval

This article provides a systematic review and meta-analysis of existing research. This project did not involve living subjects, such as humans or animals; therefore, this article did not require ethical approval.

RESULT

Literature Searching

From 3 databases, 80 articles were found and screened. 23 of the articles are removed due to duplication from other databases. 57 articles are screened and retrieved, all of the articles are found during the retrieval phase. 57 reports are screened using eligibility criteria, resulting in 54 articles are excluded. 18 articles are excluded because of the publication year issues, 7 articles are excluded because of not assessing female sexual function. 7 articles are excluded because of techniques not included the Davydov / SIS procedure. 1 article excluded because of language issues, and 21 articles are excluded because of the full text availability. 3 articles are included for this review. Literature searching flowchart shown in figure 1.

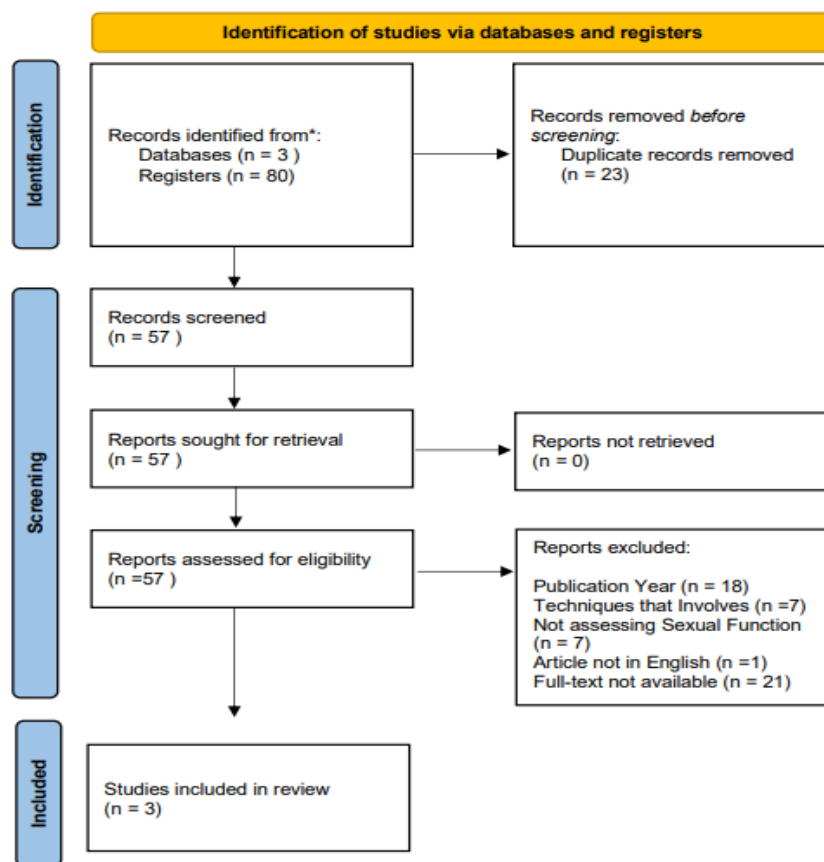


Figure 1. Literature searching flowchart shown in

Risk of Bias

Risk of bias assessed using ROBINS-I in 2 studies,^{11,12} Newcastle-Ottawa Quality Assessment Scale (NOS) in 1 study.¹³ From 3 studies that included, All of the studies have a moderate risk of bias. Zhou et al, having a moderate risk on confounding domain, deviation from intervention domain, measurement outcomes, and selection of reported results. Ding et al, showed moderate risk of bias from confounding domain, Measurement of outcomes, and selection of the reported results. Kang et al, having a moderate risk of bias on domain 2 from NOS (comparability). Risks of Bias resume are shown in Figure 2a and 2b.

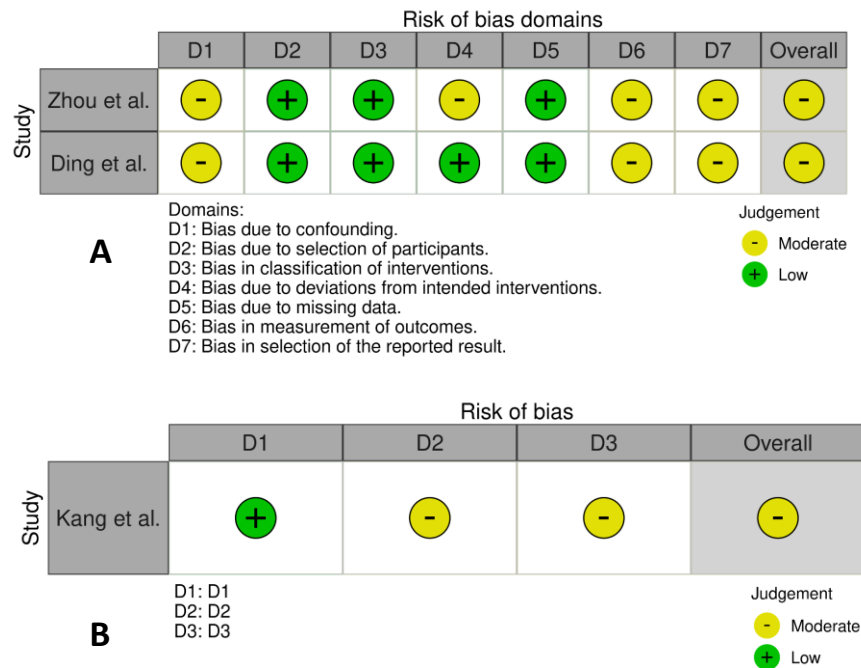


Figure 2. Risk of Bias Resume of studies that included (a. ROBINS-I, b. Newcastle-Ottawa Stage)

Patient and Study Characteristic

There are 3 studies that are included in this review.¹¹⁻¹³ Two of the studies are using cohort design, one with prospective and the other one is retrospective.^{11,12} One study using cross sectional studies.¹³ All of the articles were assessing the sexual outcomes of MRKH patients who underwent surgery as a treatment. All of the sexual function was assessed using FSFI score. One study also assesses the sexual function of the patient who underwent non-surgical method (Moulding).¹³ All of the studies assessed the duration of molding after surgery. Zhou et al. assessed the outcomes on 3 surgical modalities that consisted of shear vaginoplasty, SIS graft, and Laparoscopic Davydov.¹² Ding et al. assessed the outcomes on 2 surgical modalities that consisted of SIS graft and Laparoscopic Davydov.¹¹ From all studies that included, a total of 305 participants were obtained. Summary of the study characteristics that included can be seen in table 1.

Table 1. Summary of the study characteristics

Author	Year	Study Design	Country	Number of Participants	Subject	Outcome
Zhou et al.	2021	Retrospective Cohort	China	117	Patient with MRKH who underwent vaginoplasty from January 2017 until October 2020 in Fudan University Hospital	Effectiveness and long-term anatomical and sexual outcomes.
Ding et al.	2015	Prospective Cohort	China	75	Patient with MRKH who underwent vaginoplasty using SIS graft or laparoscopic Davydov procedure	Anatomical and sexual function results
Kang et al.	2019	Cross Sectional	China	133	Women with MRKH syndrome treated with vaginal dilation or surgical procedure	Sexual function, quality of life, anatomical results.

Duration of Moulding Use and Total Vaginal Length Post-Operation

The Duration of moulding use and post treatment vaginal length are pooled from three studies. The duration of mold usage varied across surgical and nonsurgical techniques. Overall duration of mould use in non-surgical methods is shorter than the surgical method described in Kang et al.¹³ study. From 2 studies, patients who undergo laparoscopic Davydov procedure using mould significantly shorter than patients who undergo SIS graft and Sheares method.^{11,12} Summary of duration in mold usage are shown in table 2.

Table 2. Duration of Mold Usage in Patient

Author	Year	Duration of Mould Usage (Month)			
		Surgical			Non-surgical
		Laparoscopic Davydov	SIS Graft	Sheares Vaginoplasty	
Zhou et al.	2023	3.9 ± 1.5*	8.8 ± 3.7*	6.8 ± 2.2*	-
Ding et al.	2015	4.8 ± 1.6*	7.8 ± 3.3*	-	-
Kang et al.	2019		<6 : 68.9% 6-12 : 11.1% 12-36 : 6.7% >48 : 13.3%		<6 : 72.7% 6-12 : 20.5% 12-36 : 2.3% >48 : 4.5 %

*P < 0,05

All of the studies that included, all of the studies measured vaginal length after treatment. Patients who undergo surgical treatment having longer vaginal length rather than patients who undergo non-surgical treatment as shown by Kang et al.¹³ Zhou et al showed that patients who undergo surgical treatment using laparoscopic Davydov procedure have a longer vaginal length rather than patients who undergo SIS graft or sheares vaginoplasty procedure.¹² Ding et al showed a similar result that patients who undergo laparoscopic Davydov procedure have a longer vaginal length than SIS graft group.¹¹ Summary of post-treatment vaginal length are shown in table 3.

Table 3. Post Treatment Vaginal Length in Patient

Author	Year	Post Treatment Vaginal Length (cm)			
		Surgical			Non-surgical
		Laparoscopic Davydov	SIS Graft	Sheares Vaginoplasty	
Zhou et al.	2023	8.1 ± 1.1*	7.1 ± 0.8*	7.9 ± 1.2*	-
Ding et al.	2015	7.3 ± 1.3*	6.8 ± 0.9*	-	-
Kang et al.	2019		8.1 ± 1.6*		5.6 ± 2.0*

*P < 0,05

Analysis of Surgical Modalities to sexual function based on FSFI score

Two articles were included in meta-analysis.^{11,12} Post intervention means FSFI scores are pooled and analyzed. From the analysis, both articles showed no statistically significant difference in FSFI score after intervention in both groups who underwent laparoscopic Davydov or SIS graft (SMD 0.09; 95% CI [-0.25-0.44]; Z = 0.53; p = 0.60) with low heterogeneity in the results (Chi² = 0.01, I² = 0%). Subgroup analysis was conducted based on each domain of FSFI (Desire, Arousal, Lubrication, Orgasm, Satisfaction, and Comfort). Figure 3 showed the forest plot for pooled FSFI scores between two groups.

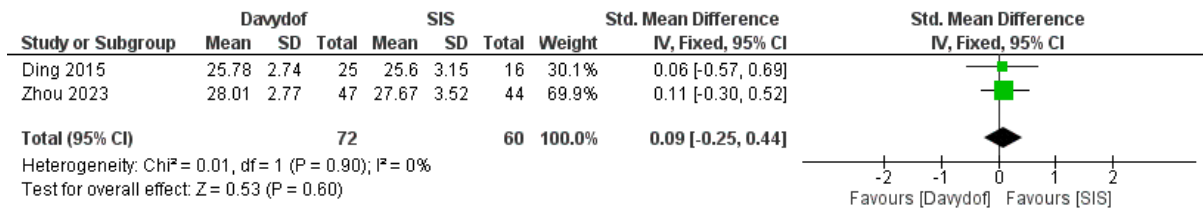


Figure 3. Forest-plot of the post intervention FSFI score between two groups

Desire

From the Desire domain, There is a significant difference between patients who undergo SIS graft and laparoscopic Davydov procedure on the overall effect. Patients who undergo SIS graft have a better desire score significantly rather than patients who had laparoscopic Davydov procedure (SMD 0.4; 95% CI [0.05-0.75]; Z=2.24; P=0.02). The heterogeneity among studies that included are low and consistent (Chi² = 0.03, I² = 0%). Figure 4 showed the forest plot for pooled desire domain score of FSFI between two groups.

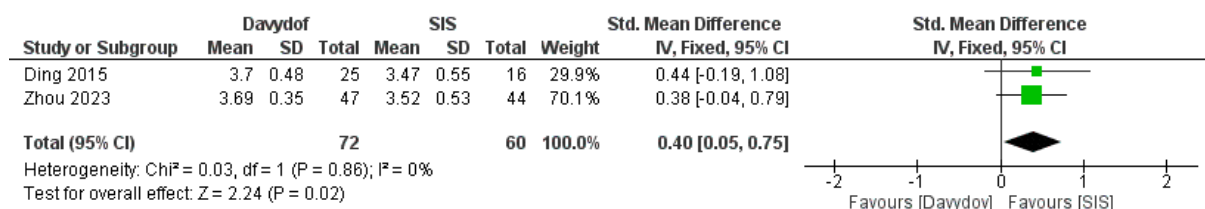


Figure 4. Forest plot of the post intervention desire domain score of FSFI

Arousal

From the arousal domain, There is a significant difference between two groups on the overall effect. Patients who undergo SIS graft have a better score significantly than patients who had laparoscopic Davydov procedure (SMD 0.71; 95% CI [0.35-1.08]; Z=3.86; P=0.0001). The heterogeneity among studies that included are high and inconsistent (Chi² = 9.98, I² = 90%). Figure 5 showed the forest plot for pooled arousal domain score of FSFI between two groups.

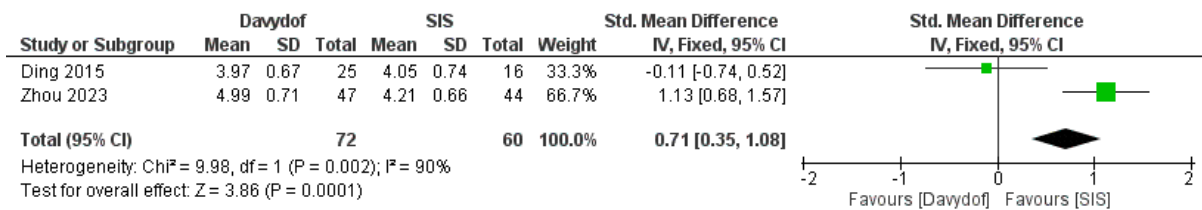


Figure 5. Forest plot of the post intervention arousal domain score of FSFI

Lubrication

From the lubrication domain, There is no significant difference between two groups on the overall effect (SMD -0.13; 95% CI [-0.47-0.22]; $Z=0.72$; $P=0.47$). The heterogeneity among studies that included are low and consistent ($\chi^2 = 0.06$, $I^2 = 0\%$). Figure 6 showed the forest plot for pooled lubrication domain score of FSFI between two groups.

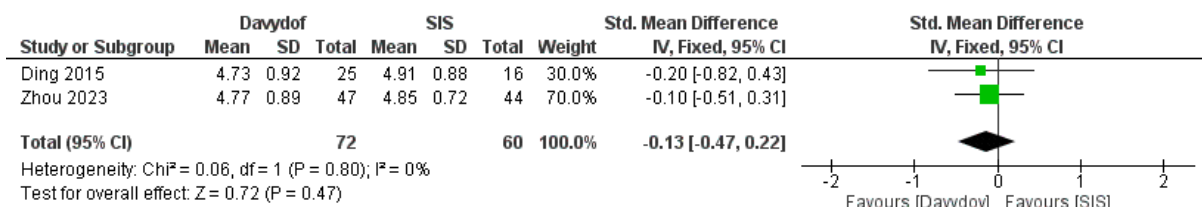


Figure 6. Forest plot of the post intervention lubrication domain score of FSFI

Orgasm

From the orgasm domain, There is a significant difference between patients who undergo SIS graft and laparoscopic Davydov procedure on the overall effect. Patients who undergo laparoscopic Davydov procedure better orgasm score significantly rather than patients who had SIS graft procedure (SMD -0.4; 95% CI [-0.85- (-0.15)]; $Z=2.78$; $P=0.005$). The heterogeneity among studies that included are low and consistent ($\chi^2 = 1.02$, $I^2 = 2\%$). Figure 7 showed the forest plot for pooled orgasm domain score of FSFI between two groups.

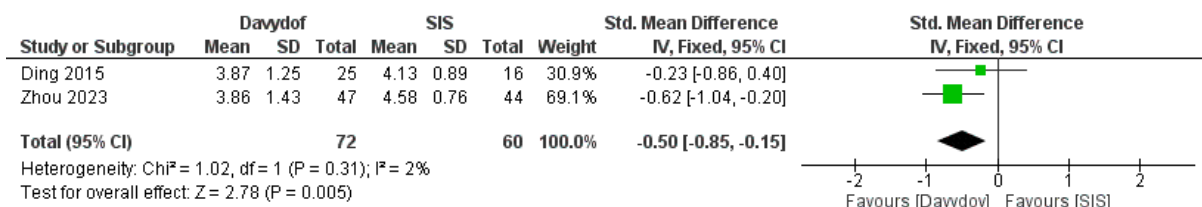


Figure 7. Forest plot of the post intervention orgasm domain score of FSFI

Satisfaction

From the satisfaction domain, There is a significant difference between patients who undergo SIS graft and laparoscopic Davydov procedure on the overall effect. Patients who undergo

SIS graft have a better satisfaction score significantly than patients who had laparoscopic Davydov procedure (SMD 0.39; 95% CI [0.04-0.74]; Z=2.21; P=0.03). The heterogeneity among studies that included are moderate and consistent ($\text{Chi}^2 = 1.26$, $I^2 = 21\%$). Figure 8 showed the forest plot for pooled satisfaction domain score of FSFI between two groups.

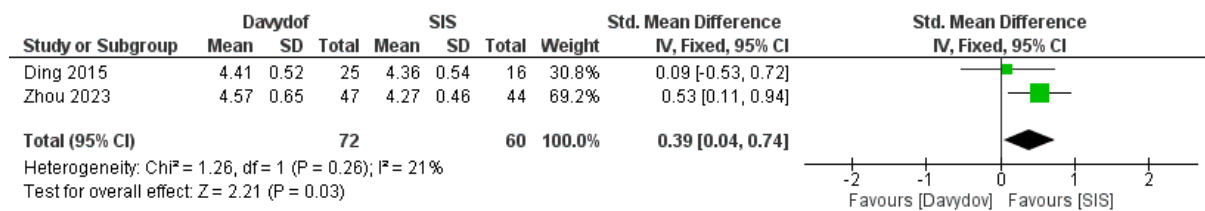


Figure 8. Forest plot of the post intervention satisfaction domain score of FSFI

Comfort / Pain

From the comfort / pain domain, There is no significant difference between two groups on the overall effect (SMD 0.24; 95% CI [-0.10-0.59]; Z=1.39; P=0.17). The heterogeneity among studies that included are low and consistent ($\text{Chi}^2 = 0.07$, $I^2 = 0\%$). Figure 9 showed the forest plot for pooled comfort domain score of FSFI between two groups.

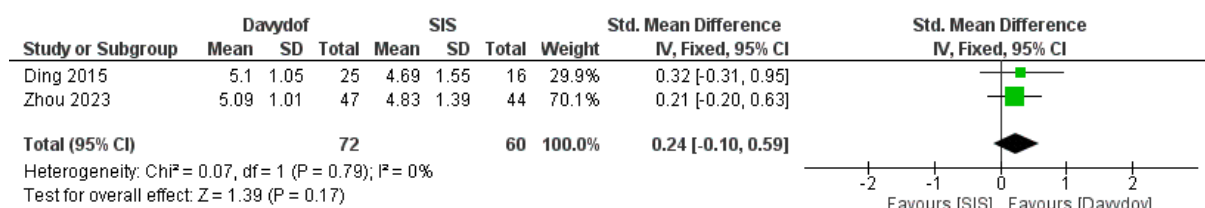


Figure 9. Forest plot of the post intervention comfort / pain domain score of FSFI

DISCUSSION

Main objective in management of MRKH syndrome is creating a functional neovagina for the patient's in order to have a normal coitus and sexual function.^{6,14} Various treatment modalities for creating a functional neovagina can be done, From the non-surgical with less invasive treatment until creating a neovagina using surgical method. Non-surgical modality that is usually used is the usage of a dilator. The dilator consists of many sizes, the patient must progressively increase the dilator size in order to have a good functional neovagina. These modalities only can be done if the vaginal dimple is long enough. Aside from that, it will take several months to have a functional neovagina.^{4,6,14} Surgical management is usually preferred rather than non-surgical management. Different types of procedure can be used for creating neovagina. The McIndoe procedure involves the creation of the vaginal cavity by dissecting the space between the rectum and bladder and insertion of vaginal mould.¹⁵ Laparoscopic Vecchietti are using subperitoneal threads to a mould in the vagina and placing a surgical traction device on the anterior abdominal wall.¹⁶ Laparoscopic Davydov procedure involving the patient's own peritoneum for epithelization of the neovagina.¹⁷

Small intestine submucosa (SIS) graft is a new proposed method for creating neovagina, when the surgeon uses the small intestine graft to create a neovagina that wrapped in a surgical mould, this method can be adjunct to McIndoe procedure.⁵ Until now, types of surgical procedure that used for creating neovagina are still an issues. In this review, we are comparing the SIS graft and laparoscopic Davydov to the FSFI score that mirrors the patient's sexual function.

Both Small intestine submucosa (SIS) graft and Laparoscopic Davydov techniques are required to use moulding after surgery. Mold is also used in self dilator procedures. Kang et al. showed that the duration of moulding usage is shorter in groups who undergo non-surgical intervention rather than groups who had surgical intervention. Results from this analysis can be due to different principles in the use of moulds in post operative novagina creation and as a non-surgical modality. Moulding after neovagina surgery is used to maintain the width and length of the neovagina after surgery. With a normal width and length of neovagina making patients more likely to have a normal sexual life and ensuring epithelization of the neovagina.^{18,19} In contrast, Moulding or dilatation concept as a non-surgical treatment is creating a vaginal canal that mimicking the normal vagina until the patients can have an sexual intercourse.²⁰ From this studies, two articles are having a sam result in moulding use after surgery. From the two articles that included, SIS graft groups require vaginal moulding longer than the laparoscopic Davydov group. This can be done because the epithelization of the neovagina is faster in the laparoscopic Davydov groups because of the usage of peritoneum. Peritoneum is a well-vascularized tissue and has a great regenerative capacity. Thus making the time of moulding use is significantly lower.^{21,22}

Vaginal length is one of the aspects that can affect sexual functions. Recent studies showed that vaginal length or volume is significantly correlated with FSFI pain domain score, and some of the studies are using this aspect as an indicator for successfulness of surgery in creating neovagina.^{20,23} From this review, vaginal length are significantly better in patients who undergo surgical intervention rather than patients who had non-surgical intervention. In the surgical intervention groups, patients who undergo laparoscopic Davydov procedure have significantly longer vaginal length than the other surgical modalities. Vaginal length is associated with the rate of vault granulation tissue that developed. Previous studies reported that the rate of vault granulation tissues that developed after laparoscopic Davydov procedure are the lowest compared to other modalities (18.7%-31.9%).^{12,24}

Post-operative sexual function is one of the main points that has to be assessed due to our main objective in treating MRKH patients. From our meta-analysis that was conducted there is no significant difference in the overall FSFI score between SIS and laparoscopic Davydov procedure. Subgroup analysis was conducted and results in no significant difference in the objective sensation (lubrication and comfort/pain), but there are significant differences in subjective feelings (Desire, Arousal, Orgasm, and Satisfaction). Desire, Arousal, and Satisfaction score are significantly better in groups who had SIS graft group, Orgasm score are better in patients who undergo laparoscopic Davydov procedure. Aligned with previous research that was conducted by Zhiyang Xu et al, improvement on sexual arousal and satisfaction are also improved in the SIS graft group. This three domain can be significantly better in SIS graft group because of the prolongation of the

postoperative time that makes patients more comfortable with the new vagina as the postoperative time goes on, thus can make patients have positive feedback until the patients sexual function approaches the normal level.²⁵ Another possibility that can make some domains are significant in SIS graft groups is the fact that the intestine and rectum are 2 of the organs that have many receptors (specially mechanoreceptors) that can be triggered during intercourse resulting in the more pleasurable sexual intercourse.²⁶

CONCLUSION

In conclusion, there is no significant difference in the overall FSFI score between patients who undergo the laparoscopic Davydov procedure and those receiving SIS grafts for neovagina creation. However, SIS grafts demonstrate better outcomes in the desire, arousal, and satisfaction domains, while the laparoscopic Davydov procedure shows superiority in the orgasm domain. Duration of moulding use is shorter in laparoscopic Davydov. Additionally, anatomical outcomes are more favorable with the laparoscopic Davydov procedure, highlighting its advantages in structural results.

LIMITATION

In this analysis, there are several limitations that should be considered. The sample size is limited, which may reduce the statistical power of the findings. Additionally, the overall results are not statistically significant, highlighting the need for further investigation with larger and more diverse populations. Moreover, all studies originate from a single country, which may introduce geographical and cultural biases. These limitations emphasize the need for more comprehensive, multicenter, and international studies to provide more robust and globally applicable conclusions.

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