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A sub inguinal microscopic varicocelectomy versus same approach without use of microscope

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Abstract:
Varicocele is a usually painless common condition that affects the scrotal veins, and associated with fertility problems. Complication of varicocele may include hypo-gonadism and azospermia. Diagnosis of varicocele by history and examination and Doppler scrotal ultrasound semen analysis may be needed, treatment of varicocele either conservative or surgical, the gold standard surgical approach are microscopic sub inguinal varicocelectomy. Aims of the study to analyze and compare the conception success outcome between microscopic and conventional ligation of varicocele. A total of 96 patients aged between 19 and 56 years, divided into two groups according to type of ligation, all cases were observed and followed up over a period of 3 years, the two groups were compared spontaneous and total conception rate with survival analysis. From this study, we noted that microscopic varicocelectomy provides better outcomes than conventional ligation in attaining spontaneous and induced conception.

Keywords: Microscopic, Sub Inguinal, Varicocelectomy, Infertility, Conception.

استئصال دوالي الخصية المجهري تحت الإربي مقابل نفس النهج الجراحي دون استعمال المجهر

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الملخص:
دوالي الخصية حالة شائعة غير مؤلمة عادةً، تُصيب أوردة كيس الصفن، وترتبط بمشاكل في الخصوبة. قد تشمل مضاعفات دوالي الخصية قصور الغدد التناسلية وانعدام الحيوانات المنوية. تُشخَّص دوالي الخصية عن طريق الفحص السريري، وقد يلزم إجراء تحليل السائل المنوي وكذلك استخدام الموجات فوق الصوتية دوبلر لفحص كيس الصفن. علاج دوالي الخصية إما تحفظي أو جراحي، والنهج الجراحي الأمثل هو استئصال دوالي الخصية تحت الإربي مجهريًا. تهدف الدراسة إلى تحليل ومقارنة نتائج نجاح الحمل بين ربط دوالي الخصية بالمجهر والربط التقليدي. شملت الدراسة 100 مريضًا تتراوح أعمارهم بين 19 و56 عامًا، مُقسَّمين إلى مجموعتين حسب نوع الربط، وتمت مراقبة جميع الحالات ومتابعتها على مدى 3 سنوات، وقورنت المجموعتان من حيث معدل الحمل التلقائي والكلي مع تحليل البقاء على قيد الحياة. من هذه الدراسة لاحظنا أن عملية استئصال الدوالي المجهرية أفضل من الربط التقليدي في رفع معدل الحمل التلقائي والمحفز.

الكلمات المفتاحية: المجهري، تحت الإربي، استئصال الدوالي، العقم، الحمل.

Introduction

Varicocele is a common disorder that enlarges the veins in scrotum with about 15% prevalence among general population. In most of occasions, varicocele is an asymptomatic condition but it can sometimes cause testicular pain and scrotal swelling. Diagnosis and classification of varicocele are based on clinical assessment in addition to pelvic and Doppler ultrasound in certain cases. They may cause mild discomfort, aches or pains. Grade 0 denotes for sub clinical category that is visualized only by Doppler ultrasound and grade I denotes to varicocele that could be only palpable using Valsalva maneuver. While Grade II denotes for palpable without Valsalva maneuver, but it is not yet visible and grade III.refers to visible varicocele (bag of worm appearance). Smaller varicoceles may be too small to see or feel. In addition, varicocele may be associated with subfertility, infertility and azoospermia as 30 – 40% of infertile men have palpable. Shrinking in the size of testicles, (testicular atrophy) may also occur, as well as decline in testosterone levels (male hypogonadism). Semen analysis should be done to verify concerns on fertility. Varicocele treatment depends on its severity; the conservative treatment is usually sufficient for low-grades. Whilst varicocelectomy is, a surgical option reserved to manage painful or infertility associated cases. [1]

Several varicocelectomy approaches do exist. These can be open like retroperitoneal and conventional inguinal approaches, microsurgical like inguinal and sub inguinal ones, laparoscopic repairs or radiographic embolization. Some authors consider the microsurgical varicocelectomy as the "gold standard procedure" because of the lowest risk of adverse events like recurrence, hydrocele formation and testicular atrophy, as well as better outcomes regarding fertility and improving the sperms' quality, number and motility as well as decrease in DNA fragmentation. In addition, the sub inguinal approach, in particular, is also associated with less operative and postoperative pain than inguinal ones. Nevertheless, the sub inguinal technique may confer challenge because of the higher vasculature complexity encountered. [2, 3]

Practicing microscopic procedure needs only local anesthesia and provides optimal visualization of the surgical field allowing separating the spermatic veins, testicular arteries, and associated lymphatic system. Those are advantages regarding convenience and achieving the targets of the operation. In addition, microscopic varicocelectomy shows higher safety than laparoscopic ligation [4 – 7]

Aim of study: To compare the conception and spontaneous conception outcomes of microscopic varicocelectomy with conventional ligation with regard to time of observation after operation.

Methods

Study design and setting

An observational prospective cohort study conducted at urology department in Al-Hikma hospital, involved observation and analysis of 100 patients with varicocele of different degrees and ages, equally selected into two groups: one underwent microscopic varicocelectomy and the other underwent conventional ligation.

Data collection and analysis procedures

No intention to select or allocate patients for procedure for the sake of research. Observation of both groups was for a total of 20 months after procedure. Analysis was done with SPSS version 23.0 and both groups were compared for period of observation as well as baseline data. Numerical variables were checked first with Smirnov-Kolmogorov test for normality then analyzed accordingly with Student's t test or Mann-Whitney U test. Categorical variables were compared with Chi square test or Fisher exact test according to expected values in the cells. Kaplan-Meier plots were generated for time weighted outcomes comparison across both groups with Mantel-Cox Log-rank test (for monovariate survival analysis). Multivariate survival analysis was executed then with Cox' regression including all variables with $P < 0.25$ in monovariate analysis to investigate the independent predictors for the outcomes (events) weighted for time of observation. Hazard ratio (HR) was generated and named Benefit ratio (BR), as the outcome event was desirable. Significant results were considered as $P \leq 0.05$ in monovariate and multivariate analysis, and BR with 95% confidence interval (CI) was only demonstrated for significant results (independent predictors).

Results

A total of 100 cases were included in the study, divided into two equal groups (50 subjects both).

Comparison of baseline characteristics of the cases included in the study across study groups are demonstrated in table (1) and of outcomes is shown in table (2). Comparison of no conception versus any conception yielded a significant difference with $P = 0.001$, while comparison of spontaneous conception to other cases yielded $P = 0.017$

Table 1. Baseline characteristics across types of procedure: monovariate analysis.

Characteristics	**Type of procedure**		***P***
	Micro procedure **Mean ± SD / median** **N (%)**	**Low ligation** **Mean ± SD / median** **N (%)**	
Age	39.2±8.7 / 40	33.8±7.2 / 34	0.001 t *
Months of observation (to conception)	11.0±4.8 / 10.5	13.2±4.7 / 13	0.022 M *
Years of infertility	5.7±5.5 / 4	3.6±3.1 / 3	0.155 M
Clinically significant varicocele	34 (68.0%) †	40 (80.0%) †	0.171 C
Testicular difference	16 (32.0%) †	5 (10.0%) †	0.007 C *
Testicular pain	27 (54.0%) †	38 (76.0%) †	0.021 C *
Laterality: Right side Left side Bilateral	1 (2.0%) † 7 (14.0%) † 42 (84.0%) †	2 (4.0%) † 10 (20.0%) † 38 (76.0%) †	0.317 C
Baseline number of sperms x 10^6	21.85±20.21 / 17.5	20.89±15.13 / 16.5	0.804 M
Baseline total motility	16.3%±10.4% / 16.0%	14.2%±9.1% / 12.5%	0.285 t
Baseline abnormal forms	78.8%±30.9% / 92.0%	83.7%±21.0% / 90.0%	0.831 M
Baseline azoospermia	6 (12.0%)	2 (4.0%)	0.269 F
Baseline significant DNA fragmentation	14 (28.0%)	6 (12.0%)	0.046 C*

SD: standard deviation. * Statistically significant difference at 95% level of confidence. a: t-test. M: Mann-Whitney U test. C: Chi square test. F: Fisher exact test. †: number (rate).

Table 2. Outcome of conception across types of procedure: monovariate analysis.

Status	Type o procedure		*P*
	Micro- procedure	Low ligation	
Unmarried (Excluded from analysis)	2 (4.0%) †	1 (2.0%) †	-
No conception	13 (26.0%) †	29 (58.0%) †	0.001 C*
Conception with Assisted fertilization	11 (22.0%) †	13 (26.0%) †	0.017 C*
Spontaneous conception	24 (48.0%) †	7 (14.0%) †	

SD: standard deviation. * Statistically significant difference at 95% level of confidence. a: t-test. M: Mann-Whitney U test. C: Chi square test. F: Fisher exact test. †: number (rate).

Comparison of outcomes across study groups with time to event weight (survival analysis) with monovariate (Mantel-Cox' Log-rank test with Kaplan-Meier's plot) is shown for event of any conception in figure 1 and for event of spontaneous conception in figure 2 with statistically significant difference and superiority of Micro-varicocelectomy for both events (P = 0.001 and 0.013, respectively).

Age, years of infertility, clinically significant varicocele, testicular difference, testicular pain and baseline significant DNA fragmentation met the criteria of P <0.025 in the monovariate analysis for difference across study groups. Therefore, those factors were included in Cox' regression analysis.

For any conception event, micro-varicocelectomy and presence of testicular difference were predictors for faster attainment, P = 0.001and 0.039, BR = 3.809 (95% CI: 1.773 - 8.182) and 2.337 (95% CI: 1.043 - 5.233); respectively. While presence of either baseline abnormal forms rate and baseline azoospermia were negative independent predictors for (against) attainment of conception, P = 0.027 and 0.029, BR = 0.028 (95% CI: 0.001 - 0.668) and 0.026 (95% CI: 0.001 - 0.687); respectively. See figure 2 and table 3.

For spontaneous conception event, only micro-varicocelectomy was an independent predictor for the spontaneous conception P = 0.001 and BR = 4.978 (95% CI: 1.853 - 13.375). While longer years of infertility was an independent negative predictor for (against) attainment of spontaneous conception, P = 0.041 and BR = 0.797 (95% CI: 0.642 - 0.991). See figure 3 and table 4.

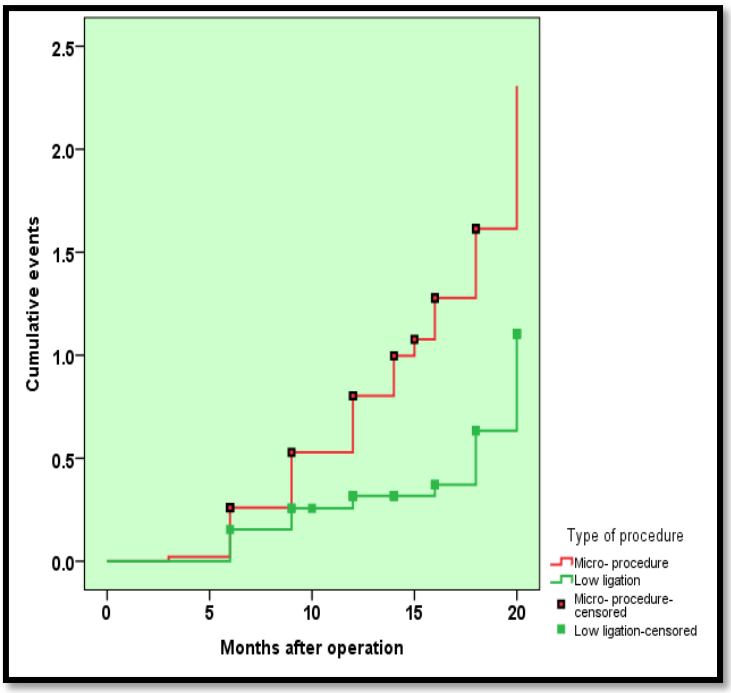

Figure 1. Kaplan-Meier plot for comparing cumulative event (any conception) with time of observation (months after operation) between Micro- procedure and Low ligation.

Mantel-Cox Log Rank X^2 11.232, P = 0.001 (Statistically significant difference).

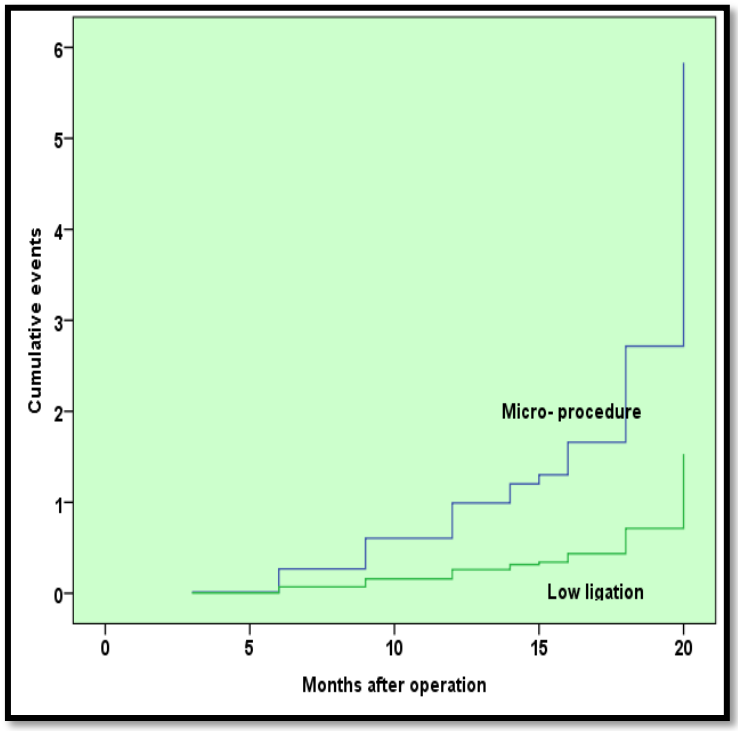

Figure 2. The Benefit (Hazard) plot for comparing independent time weighted effects of the surgical interventions on the event of any-conception.

Table 3. Analysis of predictors for time weighted reporting any conception; multivariate survival analysis

Characteristic	B	Wald X^2	*P*	BR (HR)	95% C.I. for BR (HR)
Type of procedure (Micro-/High ligation).	1.337	11.75	0.001*	3.809	1.773 - 8.182
Age	0.048	2.591	0.107	NA	NA
Years of infertility	-0.066	1.644	0.200	NA	NA
Clinically significant varicocele	0.475	1.787	0.181	NA	NA
Testicular difference	0.849	4.257	0.039*	2.337	1.043 - 5.233
Testicular pain	0.796	3.745	0.053	NA	NA
Laterality		1.612	0.447	NA	NA
Laterality: Right side	-0.819	0.551	0.458	NA	NA
Laterality: Left side	0.416	0.912	0.340	NA	NA
Baseline number of sperms x 10^6	0	1.117	0.291	NA	NA
Baseline total motility rate	0.402	0.033	0.857	NA	NA
Baseline abnormal forms rate	-3.574	4.88	0.027*	0.028	0.001 - 0.668
Baseline azoospermia	-3.666	4.767	0.029*	0.026	0.001 - 0.687
Baseline significant DNA fragmentation	-0.795	3.129	0.077	NA	NA

B: Beta coefficient of variation. $X2$: Chi square. BR: Benefit ratio. HR: Hazard ratio. C.I.: confidence interval. DNA: Deoxyribonucleic acid. NA: non-applicable because the variable is insignificant independent predictor. * Statistically significant independent predictor at 95% level of confidence.

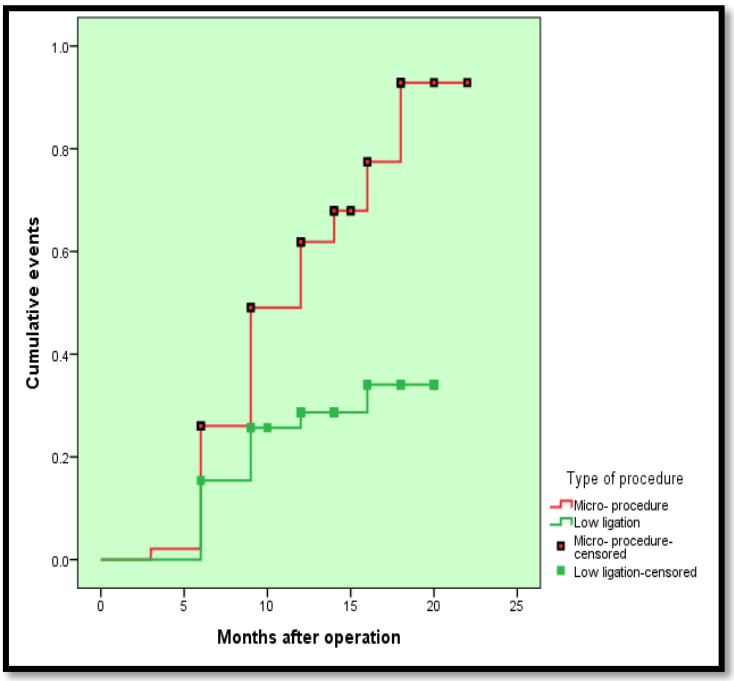

Figure 3. Kaplan-Meier plot for comparing cumulative event (spontaneous conception) with time of observation (months after operation) between Micro- procedure and Low ligation.

Mantel-Cox Log Rank X^2 6.160, $P = 0.013$ (Statistically significant difference).

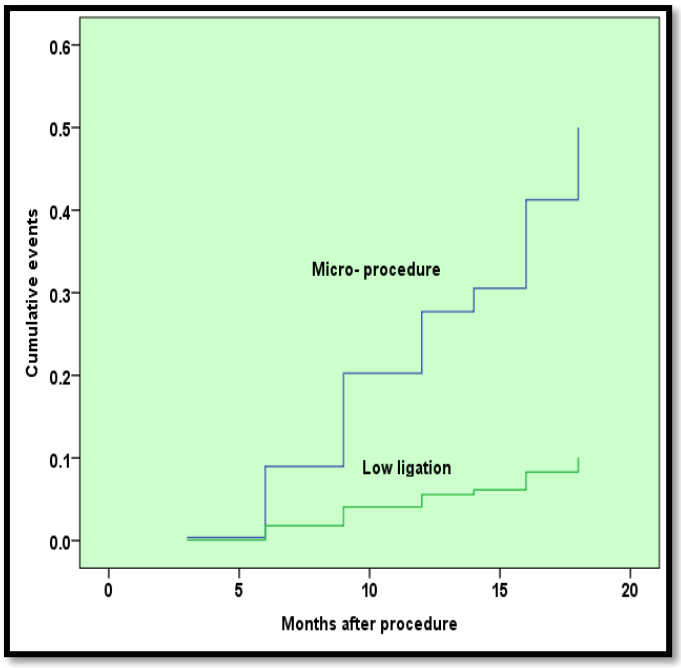

Figure 4. The Benefit (Hazard) plot for comparing independent time weighted effects of the surgical interventions on the event of spontaneous conception.

Table 4. Analysis of predictors for time weighted reporting spontaneous conception; multivariate survival analysis

Characteristic	**B**	**Wald X^2**	**P**	**BR (HR)**	**95% C.I. for BR (HR)**
Type of procedure (Micro-/High ligation).	1.605	10.133	0.001*	4.978	1.853 - 13.375
Age	0.013	0.132	0.716	NA	NA
Years of infertility	-0.227	4.182	0.041*	0.797	0.642 - 0.991
Clinically significant varicocele	0.709	2.37	0.124	NA	NA
Testicular difference	0.546	1.249	0.264	NA	NA
Testicular pain	0.733	1.886	0.170	NA	NA
Laterality		0.03	0.985	NA	NA
Laterality: Right side	-0.170	0.024	0.877	NA	NA
Laterality: Left side	-0.045	0.009	0.927	NA	NA
Baseline number of sperms x 10^6	0	0.447	0.504	NA	NA
Baseline total motility rate	-1.901	0.433	0.510	NA	NA
Baseline abnormal forms rate	-3.468	3.565	0.059	NA	NA
Baseline azoospermia	-16.105	0.001	0.970	NA	NA
Baseline significant DNA fragmentation	-0.330	0.358	0.549	NA	NA

B: Beta coefficient of variation. X2: Chi square. BR: Benefit ratio. HR: Hazard ratio. C.I.: confidence interval. DNA: Deoxyribonucleic acid. NA: non-applicable because the variable is insignificant independent predictor. * Statistically significant independent predictor at 95% level of confidence.

Discussion

The present study provides a fair comparative analysis of conception outcomes between micro varicocelectomy and open high ligation. The reported total conception rates were 70.0% and 40.0% for both procedures respectively, with statistically significant difference. In addition, spontaneous conception rates were 48.0% and 14.0% respectively, also with statistically significant result. This provides additional evidence for efficacy of

varicocelectomy and in particular, micro procedure in achieving fertility. Comparison of outcomes across study groups with time to event weight (survival analysis) with monovariate (Mantel-Cox' Log-rank test with Kaplan-Meier's plot) shown a statistically significant difference and superiority of micro-varicocelectomy for both events (P = 0.001 and 0.013, respectively). For any conception event, micro-varicocelectomy was an independent predictor for faster attainment, P = 0.001, BR = 3.809 (95% CI: 1.773 - 8.182). In addition, for spontaneous conception event, only micro-varicocelectomy was an independent predictor for the spontaneous conception P = 0.001 and BR = 4.978 (95% CI: 1.853 - 13.375). In comparing the results of this study, the results of the present study are concordant to previous studies conducted by Soetandar A *et al* (2022), Gupta C *et al* (2018), Thakur APS *et al* (2020) and Kuchakulla M *et al* (2025). Therefore, attainment of fertility is independently predicted faster with microscopic varicocelectomy than high ligation technique with about 5 times. [3, 8, 9, 13]
As coincidental findings, for any conception event, presence of testicular difference was an independent predictor for faster attainment, P = 0.039, BR = 2.337 (95% CI: 1.043 - 5.233). While presence of either baseline abnormal forms rate and baseline azoospermia were negative independent predictors for (against) attainment of conception, P = 0.027 and 0.029, BR = 0.028 (95% CI: 0.001 - 0.668) and 0.026 (95% CI: 0.001 - 0.687); respectively. In addition, for spontaneous conception event, longer years of infertility was an independent negative predictor for (against) attainment of spontaneous conception, P = 0.041 and BR = 0.797 (95% CI: 0.642 - 0.991). Those findings should be considered in initial assessment and for educating patients with infertility to not hesitate in seeking advice and arranging early treatment for varicoceles if present. The baseline azoospermia and high rate of abnormal forms may warrant additional assessment and treatment for another underlying condition within the sub-fertile male partner.

Conclusion

Micro-varicocelectomy seems to be superior over conventional high ligation as a management of varicocele and independently predicts faster attainment of conception and spontaneous conception in men with infertility regardless age, degree of lesion, baseline semen analysis or duration of infertility.

Disclaimer

The article has not been previously presented or published, and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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