Comparison of outcomes and costs of surgery versus sclerotherapy to treat hydrocele

Comparação entre resultados e custos de cirurgia e de escleroterapia para tratamento de hidrocele

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DOI: 10.31744/einstein_journal/2021GS5920

ABSTRACT

Objective: To evaluate the outcomes and costs associated with surgery versus sclerotherapy as treatment of hydroceles.

Methods: A total of 53 men consecutively treated for hydrocele at our organization, between December 2015 and June 2019, were retrospectively analyzed (39 with Jaboulay technique and 14 with sclerotherapy). All charts were reviewed, assessing clinical data, ultrasound findings, surgical data, and post-procedure outcomes. The hospital finance department calculated the cost of outpatient evaluation, complementary tests, supplies, drugs, and professionals’ costs throughout all procedures.

Results: The median age for both groups was similar (58 and 65 years old). Comorbidities were less frequent in the Surgery Group (20; 51%) than in the Sclerotherapy Group (14; 100%, p<0.05). The median length of hospital stay was 34.5±16.3 hours for the Surgery Group and 4 hours for the Sclerotherapy Group. The mean follow-up period was similar for both groups (85.4±114.8 days after surgery, and 60.9±80.1 days after sclerotherapy, p=0.467). No significant complications occurred in any patient. Success rates were 94.8% after surgery and 92.8% after sclerotherapy. The mean cost per patient was US$2,558.69 in the Surgery Group (Hydrocelectomy Group) and US$463.58 in the Sclerotherapy Group (p<0.0001). Costs directly related to in-hospital treatment procedures were significantly higher for surgery versus sclerotherapy (US$2,558.69±US$1,629.06 versus US$130.64±US$249.60; p<0.0001). Conclusion: Sclerotherapy is an excellent treatment option for idiopathic hydrocele as compared to traditional Jaboulay. It has a high success rate, low complication rates, fast discharge and patients return quicker to activities of daily living.

Keywords: Testicular hydrocele; Sclerotherapy; Cost and cost analysis; Cost-benefit analysis

RESUMO

Objetivo: Avaliar resultados e custos associados à cirurgia e à escleroterapia como tratamentos das hidroceles.

Métodos: Foram tratados consecutivamente para hidrocele em nossa instituição 53 homens, entre dezembro de 2015 e junho de 2019, os quais foram analisados retrospectivamente (39 pela técnica de Jaboulay e 14 por escleroterapia). Todos os prontuários foram revisados, avaliando dados clínicos, achados de ultrassom, dados cirúrgicos e desfechos pós-procedimento. O departamento financeiro do hospital calculou o custo da avaliação ambulatorial, dos exames complementares, dos insumos, dos medicamentos e dos profissionais em todos os procedimentos.

Resultados: A idade mediana foi semelhante nos dois grupos (58 e...
OBJECTIVE

To evaluate the outcomes and the costs associated with surgery versus sclerotherapy as treatment of hydrocele.
Statistical analysis was performed using (SPSS), version 20.0 (SPSS for Mac OS X, SPSS, Inc., Chicago, Illinois, USA). Groups were compared with Pearson’s $\chi^2$ or Fisher’s tests. The Student $t$ test was used for continuous variables with normal distribution, and the Mann-Whitney U test for non-normal distribution variables. Analysis of variance (ANOVA) was performed for multiple comparisons. Statistical significance was determined at $p<0.05$.

The Research Ethics Committee approved the present study (CAAE: 24236619.0.0000.0071, protocol 3.790.379).

I RESULTS

Demographic data are presented in table 1. The median ages for both groups were similar (surgery 58.3±14.2 years versus sclerotherapy 65.3±7.9 years; $p=0.1014$). The body mass index (BMI; kg/m²) was 28±3.9 and 27.1±5.2 for surgery and sclerotherapy, respectively ($p=0.59$). Comorbidities were less common in the Surgery Group (20; 51%) than in the Sclerotherapy Group (14; 100%; $p<0.05$). The time between the onset of hydrocele and the first outpatient evaluation was 31.9±29.2 months for surgery versus 40.7±31.0 months for sclerotherapy ($p=0.363$). The volume of hydrocele measured through ultrasound was similar in both groups (264.0±232.7mm for Surgery and 325.1±297.8mm for Sclerotherapy; $p=0.567$).

The results of perioperative data are shown in table 2. The time between the first outpatient evaluation and the procedure was 109.8±129.5 days for surgery and 112.6±93.8 days for sclerotherapy, with no significant difference ($p=0.942$). The median volume aspirated was 483.2±365.9mL for surgery and 366.1±212.7mL for sclerotherapy ($p=0.309$). Thirty-four (87%) patients who underwent surgery received spinal anesthesia, and three (7%) had general anesthesia. In the Sclerotherapy Group, all patients were treated under local anesthesia. A drain was placed at the surgeon’s discretion after each surgery and maintained for 24 hours. Drains were placed in 20 men (51%). The median length of hospital stay was 34.5±16.3 hours for the Surgery Group and 4 hours for the Sclerotherapy Group. The mean follow-up period was similar for both groups (85.4±114.8 days after surgery and 60.9±80.1 days after sclerotherapy; $p=0.467$). No significant complications occurred in any patient. Minor complications occurred in 18 (46%) patients after surgery, and none was found in the Sclerotherapy Group.

Success rates were 94.8% after surgery and 92.8% after sclerotherapy. Hydrocele recurred in two men (5%) who underwent surgery. For these patients, we performed aspiration and sclerotherapy. For seven men (50%) in the Sclerotherapy Group, a second procedure was required, and for one of these men, a third procedure was performed to obtain success (Table 2).

| Table 1. Demographics data |

| Variants | Surgery Group (n=39) | Sclerotherapy Group (n=14) | $p$ value |
|----------|----------------------|---------------------------|-----------|
| Age, years | 58.3±14.2 | 65.3±7.9 | 0.101 |
| Weight, kg | 81.6±12.7 | 82.9±15.4 | 0.824 |
| Height, m | 1.71±0.05 | 1.72±0.05 | 0.442 |
| BMI, kg/m² | 28±3.9 | 27.1±5.2 | 0.590 |
| Comorbidities | 20 (51) | 14 (100) | 0.0007 |
| Onset of symptoms, months | 31.9±29.2 | 40.7±31.0 | 0.363 |
| Previous surgery | 9 (23) | 2 (14) | 0.496 |
| Volume of hydrocele in ultrasound, mL | 264.0±232.7 | 325.1±297.8 | 0.567 |

Table 2. Results of perioperative data

| Variants | Surgery Group (n=39) | Sclerotherapy Group (n=14) | $p$ value |
|----------|----------------------|---------------------------|-----------|
| Time to procedure, days | 109.8±129.5 | 112.6±93.8 | 0.942 |
| Volume aspirated, mL | 483.2±365.9 | 366.1±212.7 | 0.309 |
| Aspect | Clear | 33 (84) | 11 (78) |
| | Turbid | 1 (2) | 3 (21) |
| Anesthesia | Local | 0 | 14 (100) |
| | Spinal | 34 (87) | 0 |
| | General | 3 (7) | 0 |
| Length of hospital stay, hours | 34.5±16.3 | 4.0±0.5 | 0.001 |
| Minor complications | 18 (46) | 0 | 0.001 |
| Follow-up, days | 85.4±114.8 | 60.9±80.1 | 0.467 |
| First recurrence | 2 (5) | 7 (50) | 0.003 |
| Volume aspirated, mL | 425.0±106.1 | 157.0±154.2 | 0.0794 |
| Aspect | Clear | 2 (100) | 3 (42) |
| | Turbid | 2 (28) | 1 (100) |
| Second recurrence | 1 (20) | 1 (14) | 0.657 |
| Volume aspirated, mL | 40 | 139 | 0.974 |

| Aspect turbid | 1 (100) | 1 (100) |

Results expressed as mean ± standard deviation or n (%).
The mean cost per patient was US$2,558.69 in the Surgery Group and US$463.58 in the Sclerotherapy Group (p<0.0001). Outpatient costs were similar in the groups (US$338.87±US$389.21 versus US$332.94±US$191.98; p=0.957). Cost directly related to in-hospital treatment procedures were significantly higher for surgery versus sclerotherapy (US$2,219.82±US$1,629.06 versus US$130.64±US$249.60; p<0.0001) (Table 3).

### Table 3. Costs (US$)

| Variants              | Surgery Group | Sclerotherapy Group | p value  |
|-----------------------|---------------|---------------------|---------|
| Consultations         | 338.87±369.21 | 332.94±191.98       | 0.957   |
| Hospital procedure    | 2,219.82±1,629.06 | 130.64±249.60       | <0.0001 |
| Total                 | 2,558.69±1,891.94 | 463.58±249.40       | <0.0001 |

Results expressed as mean±standard deviation.

### II DISCUSSION

There are different treatment options for patients with hydrocele: observation, aspiration and sclerotherapy, and surgery. Hydrocelectomy is considered the gold standard. However, it needs to be performed in the operating room, often with spinal or general anesthesia, increasing the cost of care compared to sclerotherapy. Since it occurs mainly in young adults, it leads to loss of working days that can be seven times longer in hydrocelectomy compared to sclerotherapy. Our study aimed to evaluate the costs associated with these modalities applied to treat hydrocele in adults.

This study has some significant findings. First, we have observed a much higher cost associated with the surgical procedures when compared to sclerotherapy (US$2,558.69 versus US$463.58; p<0.0001). It represents an economy of 81% or US$2,095.11 for each patient treated by sclerotherapy. Surgery was 5.5-fold more expensive than sclerotherapy.

Even though costs associated with hydrocele treatment are not exceedingly high, it is not an uncommon disease. After several procedures performed there are significant savings, which can be even more relevant in a developing country such as ours, where resources are scarce. Other authors have shown that hydrocelectomy can bear a nine-fold higher cost than sclerotherapy.

Additionally, sclerotherapy was performed as an outpatient procedure. It brings the advantage over inpatient surgery not only regarding the costs but also convenience for patients. Hydrocelectomy can also be performed as an outpatient procedure, even though associated with higher complication rates.

Our hospital receives patients from the public health system. Most of our patients live far from our facilities, and therefore it is our choice not to perform hydrocelectomy as an outpatient procedure. For sclerotherapy, since risks are low, we adopted the outpatient routine.

Second, success rates were high for all procedures. Sclerotherapy has achieved a 92.8% success after two procedures and 100% success after three procedures. Hydrocelectomy had only two failures in our series, both successfully treated through sclerotherapy. The definition of success in the literature varies widely but ranges from 44% to 100%. Higher success rates of sclerotherapy can be achieved by increasing the number of treatments offered to patients before surgical options were explored. Sclerotherapy is, therefore, a good option for the treatment of hydrocele, mainly in elderly patients or those unfit for surgery, as also observed by other authors. Other advantages are that the patient does not need fasting, can maintain usual medications, and does not require spine or general anesthesia and their inherent risks.

Complications were more common after surgical procedures, and no events were reported in the Sclerotherapy Group. Even though complications have been reported after sclerotherapy, they are uncommon. A concern in young patients is spermatogenesis. Shan et al., have addressed this issue, and no significant impairment in spermatogenesis or fertility occurred after sclerotherapy, assuring the safety of this procedure even in young men.

Our study has some limitations. It was retrospective, and a relatively small number of patients were evaluated. However, we do not require a massive number of patients to allow further conclusions for cost analysis. Additionally, only a few papers have analyzed the cost associated with hydrocele treatment, and none was carried out in Brazil.

### CONCLUSION

Sclerotherapy is an excellent treatment option for idiopathic hydrocele comparing to traditional Jaboulay. It has a high success rate, low complication rates, fast discharge and patients return quicker to activities of daily living. No drain and major anesthesia are required. The recurrence seems to be similar after both procedures, but costs are significantly lower after sclerotherapy.
Comparison of outcomes and costs of surgery versus sclerotherapy

AUTHORS’ CONTRIBUTION
Fernando Korkes: idea, design, data acquisition, analysis, writing and review of the article. Saulo Borborema Teles: data acquisition, analysis and article writing. Matheus Prado Nascimento: review and article submission. Samira Scalso de Almeida: data acquisition, analysis and review of the article. Artur Martins Codeço: data acquisition, analysis and review of the article.

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REFERENCES
1. Saber A. New minimally access hydrocelectomy. Urology. 2011;77(2):487-90.
2. Bin Y, Yong-Bao W, Zhuo Y, Jin-Rui Y. Minimal hydrocelectomy with the aid of scrotoscope: a ten-year experience. Int Braz J Urol. 2014;40(3):384-9. Review.
3. Saber A. Minimally access versus conventional hydrocelectomy: a randomized trial. Int Braz J Urol. 2015;41(4):750-6.
4. Beiko DT, Kim D, Morales A. Aspiration and sclerotherapy versus hydrocelectomy for treatment of hydroceles. Urology. 2003;61(4):708-12.
5. Ku JH, Kim ME, Lee NK, Park YH. The excisional, plication and internal drainage techniques: a comparison of the results for idiopathic hydrocele. BJU Int. 2001;87(1):82-4.
6. Miroglu C, Tokuc R, Saporta L. Comparison of an extrusion procedure and eversion procedures in the treatment of hydrocele. Int Urol Nephrol. 1994;26(6):673-9.
7. Moloney GE. Comparison of results of treatment of hydrocele and epididymal cysts by surgery and injection. Br Med J. 1975;3(5981):478-9.
8. Shan CJ, Lucon AM, Arap S. Comparative study of sclerotherapy with phenol and surgical treatment for hydrocele. J Urol. 2003;169(3):1056-9.
9. Shan CJ, Lucon AM, Pagani R, Srougi M. Sclerotherapy of hydroceles and spermatoceles with alcohol: results and effects on the semen analysis. Int Braz J Urol. 2011;37(3):307-13.
10. Khaniya S, Agrawal CS, Koirala R, Regmi R, Adhikary S. Comparison of aspiration-sclerotherapy with hydrocelectomy in the management of hydrocele: a prospective randomized study. Int J Surg. 2009;7(4):392-5.
11. Kiddoo DA, Wallin TA, Mador DR. A population based assessment of complications following outpatient hydrocelectomy and spermatocelectomy. J Urol. 2004;171(2 Pt 1):746-8.
12. Erdas E, Pisanu G, Pomata M, Pinna G, Secchi L, Licheri S, et al. [sclerotherapy and hydrocelectomy for the management of hydrocele in outpatient and day-surgery setting]. Chir Ital. 2006;58(5):619-25. Italian.