

Cost Comparison of the Laparoscopic Burch Colposuspension, Laparoscopic Two-Team Sling Procedure, and the Transobturator Tape Procedure for the Treatment of Stress Urinary Incontinence

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Abstract

Objective: To compare medical costs of three surgical procedures for the treatment of primary stress urinary incontinence: the laparoscopic Burch colposuspension procedure, the laparoscopic two-team sling procedure, and the transobturator tape (TOT) procedure.

Methods: We performed a retrospective observational study of isolated minimally invasive surgical procedures (no concomitant surgery) in 18 women with primary stress incontinence. Six women underwent a laparoscopic Burch colposuspension procedure, six underwent a laparoscopic two-team sling, and six underwent a TOT procedure. The main outcome measure was the mean aggregated medical cost per patient treated. Itemized calculations were made for (1) equipment costs; (2) surgeon, surgical assistant, and anaesthesiologist reimbursements; (3) nursing costs; (4) operating and recovery room costs; and (5) costs of stay in hospital.

Results: The mean cost per patient undergoing a TOT procedure was \$2547 (95% CI \$2260 to \$2833); for a laparoscopic Burch colposuspension it was \$4354 (95% CI \$3465 to \$5244); and for a laparoscopic two-team sling procedure it was \$5393 (95% CI \$4959 to \$5826). Significant differences were found across procedures using a one-way ANOVA. A TOT was lower in

cost than both a Burch procedure, with a mean cost difference of \$1807.88 ($P < 0.001$), and a sling procedure, with a mean cost difference of \$2834.73 ($P < 0.001$).

Conclusion: A transobturator tape procedure has less direct medical costs than a laparoscopic Burch colposuspension or a laparoscopic two-team sling procedure in the surgical treatment of stress urinary incontinence.

Résumé

Objectif : Comparer les coûts médicaux de trois interventions chirurgicales visant la prise en charge de l'incontinence urinaire à l'effort primaire : l'intervention de colposuspension de Burch laparoscopique, l'intervention de fronde laparoscopique à deux équipes et l'intervention par bandelette transobturatrice (TOT).

Méthodes : Nous avons mené une étude observationnelle rétrospective portant sur des interventions chirurgicales à effraction minimale isolées (aucune intervention chirurgicale concomitante) chez 18 femmes présentant une incontinence urinaire à l'effort primaire. Six de ces femmes ont subi une intervention de colposuspension de Burch laparoscopique, six autres ont subi une intervention de fronde laparoscopique à deux équipes et les six dernières ont subi une intervention par TOT. Le critère d'évaluation principal était le coût médical global moyen par patiente traitée. Des calculs détaillés ont été effectués pour les éléments suivants : (1) frais liés au matériel; (2) honoraires du chirurgien, de l'assistant chirurgical et de l'anesthésiologiste; (3) frais liés aux soins infirmiers; (4) frais liés aux salles d'opération et de réveil; et (5) frais d'hospitalisation.

Résultats : Le coût moyen par patiente était de 2 547 \$ (IC à 95 %, 2 260 \$ - 2 833 \$) dans le cas de l'intervention par TOT; de 4 354 \$ (IC à 95 %, 3 465 \$ - 5 244 \$) dans le cas de l'intervention de colposuspension de Burch laparoscopique; et de 5 393 \$

Key Words: Laparoscopic two team sling, transobturator tape, laparoscopic Burch colposuspension, stress urinary incontinence, cost comparison

Competing Interests: None declared.

Received on August 6, 2012

Accepted on October 26, 2012

(IC à 95 %, 4 959 \$ - 5 826 \$) dans le cas de l'intervention de fronde laparoscopique à deux équipes. Des différences significatives ont été constatées d'une intervention à l'autre au moyen d'une analyse de la variance à un facteur. L'intervention par TOT était moins dispendieuse que l'intervention de Burch (différence moyenne de 1 807,88 \$ [P < 0,001]) et que l'intervention de fronde (différence moyenne de 2 834,73 \$ [P < 0,001]).

Conclusion : Pour ce qui est de la prise en charge chirurgicale de l'incontinence urinaire à l'effort, l'intervention par bandelette transobturatrice s'accompagne de coûts médicaux directs moins élevés que ceux qui sont associés à l'intervention de colposuspension de Burch laparoscopique ou à l'intervention de fronde laparoscopique à deux équipes.

J Obstet Gynaecol Can 2013;35(3):252–257

INTRODUCTION

Stress urinary incontinence affects up to 30% of women,¹ and approximately 4% of women will undergo surgery for urinary incontinence.² Several surgical procedures to treat SUI have been developed. Minimally invasive surgical techniques with the goals of decreasing patient discomfort, hospital stay, and recovery time have become increasingly popular.^{3,4}

The laparoscopic Burch colposuspension was one of the first minimally invasive surgery techniques used for the treatment of SUI. Reported long-term continence rates following the Burch colposuspension vary from 76% to 95%.⁵ The laparoscopic two-team sling procedure is another minimally invasive approach used to treat stress urinary incontinence. Published long-term continence rates vary from 91.1% (n = 175)⁶ to 95% (n = 100)⁷ with a mean follow-up of 1.5 years. The transobturator tape inside-out technique is a midurethral sling approach developed by de Leval in 2003.⁸ The advantages of this procedure include a shorter operating time, shorter hospital stay and quicker return to daily activities than older techniques. Published objective SUI cure rates for the TVT-O system in a small randomized control trial with follow-up at two years was 87.5%.⁹

Many studies have compared these various surgical procedures for effectiveness and have found short-term equivalency for cure of SUI.^{1–5,10} Seven trials compared

laparoscopic colposuspension (n = 264) with TVT (n = 290). There was no statistically significant difference in the reported subjective cure rates up to 18 months.¹⁰ Comparing suburethral slings, a Cochrane review found minimally invasive synthetic suburethral sling operations to be as effective as traditional suburethral slings but with shorter operating time and less postoperative voiding dysfunction.¹ With regard to the newer midurethral slings, in 17 trials (n = 2434) the obturator route was less favourable than the retropubic route in producing objective cure (84% vs. 88%; RR 0.96, 95% CI 0.93 to 0.99), although there was no difference in subjective cure rates. However, the obturator route did result in fewer bladder perforations, less voiding dysfunction, and less blood loss. Because cure rates do not seem to differ across treatment modalities, it becomes important (particularly in resource-limited health systems) to evaluate these procedures using non-clinical comparisons.

There are numerous forms of cost-comparison studies. When trivial differences are found with respect to clinical effects and non-monetary outcomes, a cost-minimization analysis is the method of choice.¹¹ In such a cost analysis the investigators measure and compare the costs of at least two alternative strategies or interventions.

The aim of our study was to compare the health care costs of these three surgical procedures for the treatment of primary stress urinary incontinence: the laparoscopic Burch colposuspension, the laparoscopic two-team sling procedure, and the transobturator tape procedure. We were unable to identify any previously reported studies that had directly compared these three procedures.

METHODS

We performed a retrospective observational study of randomly selected patients who underwent an isolated surgical intervention (no concomitant surgery) for primary stress incontinence between December 2003 and December 2009. There was no significant change in practice over this study period. Approval was obtained from the Sunnybrook Health Sciences Centre Research Ethics Board.

All procedures were performed by urogynaecology specialists at one hospital site. Six patients underwent a laparoscopic Burch colposuspension, six underwent a laparoscopic two-team sling procedure using polypropylene mesh, and six underwent a TOT procedure using the Gynecare TVT-Obturator System. There were six patients per group because the standard deviations of total costs within each group were low. All procedures were performed under general anaesthesia.

ABBREVIATIONS

QALYs	quality of life years
SUI	stress urinary incontinence
TOT	transobturator tape
TVT	tension-free vaginal tape
TVT-O	TVT-Obturator System

Table 1. Characteristics of patients

	Laparoscopic Burch	Laparoscopic two-team sling	Transobturator tape
Number of patients	6	6	6
Mean age \pm SD, years	51 \pm 6	67 \pm 8	55 \pm 12
Mean parity	1.6	2	2.25
Previous incontinence procedures, n	0/6	1/6	0/6
Postoperative complications, n	1/6	1/6	0/6
Discharged with indwelling catheter, n	0/6	2/6	0/6

Using the Gynecare TVT-O, curved trocars were used to pass a strip of polypropylene mesh underneath the urethra, through the obturator foramen bilaterally, towards the thigh folds, without entering the abdominal cavity.⁸ The tape was then positioned without tension under the mid urethra. The TVT-O procedures were performed as outpatient procedures with a Foley catheter inserted only for the duration of the procedure. Discharge criteria included adequate voiding.

The laparoscopic two-team sling allows for simultaneous dissection of the space of Retzius laparoscopically and bladder dissection vaginally.⁶ A strip of polypropylene mesh was passed through periurethral tunnels vaginally under laparoscopic guidance and sutured laparoscopically to Cooper's ligament bilaterally. A Foley catheter was placed intraoperatively and removed on the first postoperative day. A trial of void with specific voiding criteria was required for discharge. If voiding criteria were not met, the patients were either discharged with an indwelling catheter or remained in hospital for a second night with appropriate pain and nausea management and a repeat voiding trial on the second postoperative day. Home care nurse referrals were arranged for those discharged from hospital with an indwelling catheter.

The Burch procedure is a retropubic urethropexy which is performed by the placement of sutures through the internal aspect of the vaginal wall lateral to the urethrovesical junction and the urethra. These sutures are attached to Cooper's ligament, thereby suspending the vaginal wall and indirectly elevating the bladder neck.⁴ A suprapubic bladder catheter was placed before the completion of the surgery. After surgery, patients remained in hospital overnight, and the suprapubic catheter was clamped for a trial of void starting on the first postoperative day. The catheter was unclamped to measure post-voiding residual urine volume and was removed subsequently if voiding criteria were met. If the criteria were not met, patients were discharged with the suprapubic catheter in situ and a home-care referral arranged.

A detailed review of the patients' medical records was conducted to establish the direct costs related to their surgery. Itemized calculations were made for (1) disposable

equipment costs; (2) reimbursements for the surgeon, surgical assistant, and anaesthesiologist; (3) nursing costs; (4) operating room and recovery room costs; and (5) costs of hospital stay.

The finance department of the hospital provided the baseline costs of the operating room and the hospitalization, and the hourly salary of the operating room nursing personnel. Case costs of the different disposable devices and equipment were itemized by the OR nurse manager. The physician fees (surgeons, surgical assistants, and anaesthesiologists) were calculated using the October 2009 Schedule of Benefits of the Ontario Ministry of Health and Long-Term Care. Costs were estimated based on 2010 dollars.

The main outcome measure was the mean aggregated cost per patient treated. Indirect costs such as loss of income as a result of postoperative recovery were excluded from the analysis. Data were collected and statistical analysis was performed using Microsoft Excel (Microsoft Corp., Redmond, WA) and SAS software (SAS Inc., Cary, NC) by the Research Design and Biostatistics department at Sunnybrook Health Sciences Centre.

RESULTS

The mean age of patients undergoing a TOT was 55 years (SD 12), 51 years for those undergoing a laparoscopic Burch (SD 6), and 67 years for those undergoing a laparoscopic two-team sling (SD 8). The majority of procedures were primary, with only one two-team sling performed as a repeat procedure for incontinence. One third (2/6) of the patients who had a two-team sling were discharged with an indwelling catheter, but none of the patients who had a laparoscopic Burch or TOT procedure required a catheter at discharge (Table 1).

The average length of time in the OR (from the time that the patient entered the OR to the time that the patient exited the OR) for patients undergoing TOT was 58 \pm 9.8 minutes (range 60 to 140 minutes), compared with 117 \pm 29.1 minutes (range 90 to 168 minutes) for

Figure 1. Average length of surgery (hours:minutes)

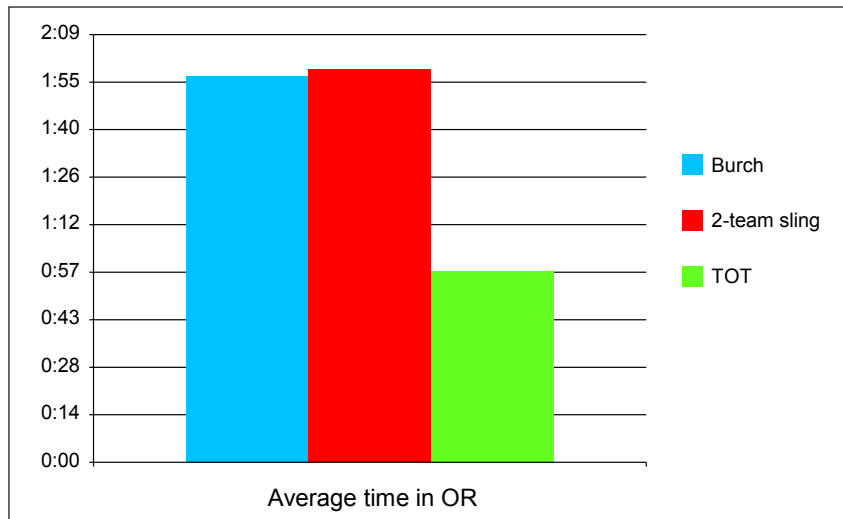


Figure 2. Average length of stay in hospital (hours)

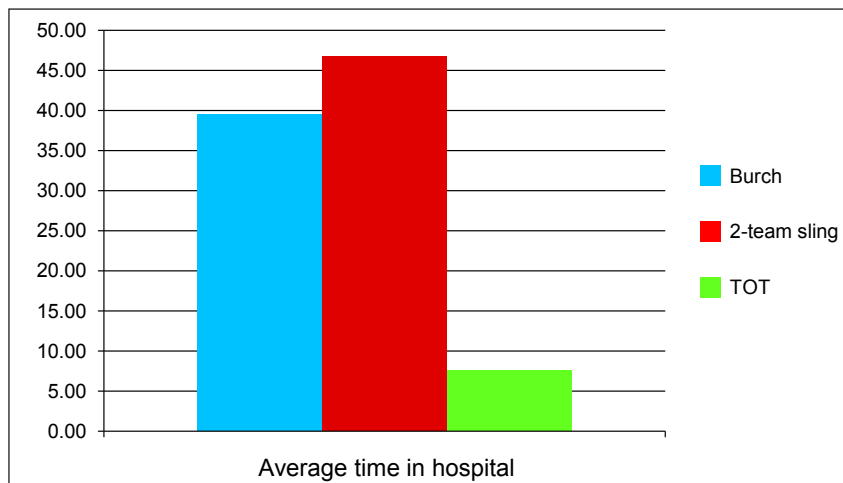


Figure 3. Total direct cost per procedure in dollars

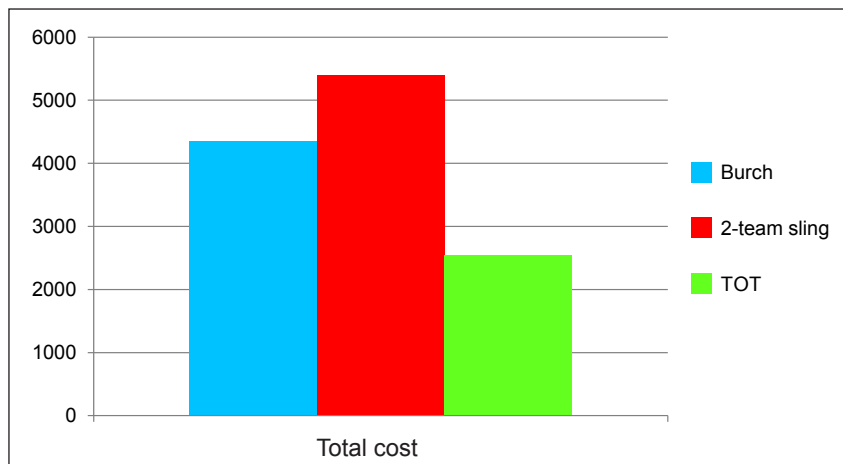


Table 2. Breakdown of costs per procedure

	Laparoscopic Burch	Laparoscopic two-team sling	Transobturator tape
Mean equipment cost/case, \$	165.66	202.42	639.05
Mean OR cost/hour (includes RN salaries), \$	447.27 (2RNs, 1RPN)	488.47 (3RNs, 1RPN)	421.29 (2RNs)
Mean duration in OR \pm SD (hours)	1.97 \pm 0.49	2.0 \pm 0.46	0.98 \pm 0.15
Mean total OR cost (includes OR costs, RN salaries, and equipment), \$	1046.78	1179.36	1051.21
Surgeon reimbursement/case, \$	470.88	826.26	381.60
Mean surgical assistant cost/case, \$	211.20	222.72	117.12
Mean anaesthesia cost/case, \$	298.07	319.88	147.82
Mean length of stay in hospital \pm SD, hours	39.5 \pm 14.2	46.7 \pm 9.4	7.6 \pm 7.3
Mean cost for recovery room and hospital stay costs, \$	2327.52	2844.75	848.81
Mean total cost,* \$ (95% CI)	4354.45 (3464.86 to 5244.04)	5392.97 (4959.78 to 5826.16)	2546.56 (2260.45 to 2832.69)

RN: registered nurse; RPN: registered practical nurse
*Includes equipment, fees, and hospital stay

patients undergoing the Burch procedure and 119 ± 26.1 minutes (range 88 to 150 minutes) for those undergoing the two-team sling (Figure 1). The mean length of stay in hospital (from arrival in the operating room to discharge from hospital) was 7.6 ± 7.3 hours (range 4 to 22.5 hours) for patients undergoing a TOT procedure, compared with 39.5 ± 14.2 hours (range 26.5 to 56 hours) for patients undergoing a Burch procedure and 46.7 ± 9.4 hours (range 29 to 55 hours) for those undergoing a two-team sling (Figure 2).

The mean cost per patient undergoing a TOT procedure was $\$2547.57 \pm 357.58$ (95% CI $\$2260.45$ to $\$2832.69$); for a laparoscopic Burch colposuspension it was $\$4354.45 \pm 1111.78$ (95% CI $\$3464.86$ to $\$5244.04$), and for a laparoscopic two-team sling procedure it was $\$5393.97 \pm 541.38$ (95% CI $\$4959.78$ to $\$5826.16$) (Figure 3). A breakdown of costs is shown in Table 2. Significant differences were found across procedures ($P < 0.001$) using a one-way ANOVA. A TOT was lower in cost than both a laparoscopic Burch procedure ($P < 0.001$) with a mean cost difference of $\$1807.88$, and a laparoscopic two-team sling ($P < 0.001$) with a mean cost difference of $\$2834.73$.

DISCUSSION

The TOT is a significantly less costly procedure than a laparoscopic Burch colposuspension or a laparoscopic two-team sling procedure at our centre. The factors that have the largest impact on the mean aggregated cost include the length of stay in hospital, the equipment cost, and the personnel cost associated with the procedure and the length

of surgical time. The higher equipment cost of the TVT-O system appears to be offset by the shorter operating time and shorter length of stay in hospital associated with this treatment. This cost could be further reduced by eliminating the surgical assistant fee, as not all TOT procedures require an assistant. For the laparoscopic Burch and two-team sling procedures, length of hospital stay seemed to have the greatest effect on the cost of the procedure.

Our findings of a lower cost associated with the midurethral sling procedure is in keeping with the majority of other cost comparison studies performed in Europe and the United States.^{12–15} Several studies have examined and compared the cost-effectiveness of the different surgical treatments for SUI, but most studies have used the TVT as the comparison for the TOT.^{12–17} Manca et al. demonstrated that the TVT resulted in lower direct health care cost, as well as an improvement in health outcome in QALYs per patient in six months of follow-up, compared to open colposuspension.¹² Similarly, an economic model created by Kilonzo et al. from a systematic review comparing TVT to several other surgical procedures suggested that TVT is superior to open colposuspension (lower cost and same QALYs) in the five years after surgery.¹³ Ankardal et al. compared the direct health care costs of open Burch, laparoscopic Burch with sutures, laparoscopic Burch with mesh, and tension-free vaginal tape procedures using a model surgical unit.¹⁴ Again, their findings showed that the TVT procedure generated a lower direct health care cost than the open and laparoscopic Burch procedures. In a comparison of the TVT procedure to laparoscopic colposuspension, Valpas et al. showed that the TVT resulted in lower direct health costs as well as

better outcomes one year after surgery.¹⁵ In contrast, in a study by Persson et al., laparoscopic colposuspension was overall less expensive than the TVT procedure,¹⁶ as four patients required re-operation compared with only one in the laparoscopic Burch group after one year of follow-up. Only one study to date has compared the TVT with the TOT procedure. The results of this cost–utility analysis alongside a randomized control trial demonstrated a non-significant average saving of \$1133 in the TOT group and no difference in average QALYs between the groups.¹⁷

Limitations of this study include the failure to account for direct costs not captured (e.g., home care requirements, readmission for postoperative complications, or re-operation for recurrence, failure, or pain) and indirect costs (e.g., time lost from work). The patient demographics were not equivalent across the three groups as the cases were randomly selected. We chose patients who underwent a sole procedure for the treatment of SUI. If all groups were similar the conclusions drawn would be stronger. However, because the length of stay cost was related to pain, nausea, and voiding management, and not to medical complications, we did not feel that age differences significantly affected length of stay. Because of the high success rates, minimal recovery, and ease of insertion, midurethral slings have largely replaced other options as the treatment of choice for women with stress incontinence. However, having alternatives to midurethral sling surgical treatments remains important, and therefore future studies should evaluate the long-term cost-effectiveness of all surgical options with analysis of their effect on quality of life and rates of postoperative complications.

It is also important to recognize that many patients undergo concomitant surgery for other gynaecological conditions such as prolapse at the time of anti-incontinence surgery. It remains to be determined which procedure is most cost-efficient under such circumstances. Our study focused on isolated stress incontinence procedures.

CONCLUSION

With the multitude of minimally invasive surgical methods with similar cure rates available for the treatment of stress urinary incontinence, the cost effectiveness of a surgical procedure becomes highly relevant in surgical case selection. The results from our study show that a transobturator tape procedure has less direct medical costs than a laparoscopic Burch colposuspension or a laparoscopic two-team sling procedure in the surgical treatment of stress urinary incontinence.

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