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ORIGINAL ARTICLE

Hand/Peripheral Nerve

A Cost and Efficiency Analysis of the WALANT Technique for the Management of Trigger Finger in a Procedure Room of a Major City Hospital

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Background: The "Wide Awake Local Anesthesia No Tourniquet" (WALANT) technique is gaining popularity in hand surgery owing to its benefits of reduced cost, shorter hospital stay, improved safety, and the ability to perform active intraoperative examinations. The aim of this study is to analyze the cost savings and efficiency of performing A1 pulley release for treatment of trigger finger using the WALANT technique in a major city hospital procedure room (PR) as compared with the standard tourniquet, operating room (OR) approach.

Methods: Patients who underwent trigger finger release between 2012 and 2017 were identified. Demographic and procedural information were obtained. Patients were followed for an average of 82 and 242 days in the PR and OR groups, respectively.

Results: Thirty-nine PR and 37 OR patients were identified. Case length and turnover time were shorter in the PR group [21.4 ± 7 versus 23.5 ± 14.3 min ($P = 0.942$) and 31.1 ± 11.1 and 65.3 ± 17.7 min ($P < 0.001$), respectively). The cost of the instrument tray utilized was calculated as $3,304.25 in the main OR and $993.79 in the PR. Cost per minute for all personal services in the OR was calculated to be $44/min, a cost that was virtually absent in the PR. Complication rates did not differ between both groups.

Conclusion: Performing A1 pulley release for treatment of trigger finger using the WALANT technique is both cost effective and time efficient compared to performing the same procedure in the main OR of a major city public hospital.
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INTRODUCTION

In recent years, there has been a movement in the field of ambulatory hand surgery away from tourniquet surgery and towards "Wide Awake Hand Surgery" or the "Wide Awake Local Anesthesia No Tourniquet (WALANT)" technique. Initially proposed by Dr. Donald Lalonde in 2005, the WALANT technique involves injection of subcutaneous lidocaine and epinephrine directly into the operative area 26 minutes before the planned operation to allow for the effects of analgesia and vasoconstriction to take place, thereby negating the need for use of an intraoperative tourniquet.[1,2]

In general, benefits of the WALANT technique are many and include reduced cost and waste, fewer preoperative visits, shorter hospital stay, improved patient safety, and the ability to perform active intraoperative movement examinations. Additionally, it is known that tourniquet surgery results in greater incurred costs for both the patient and the healthcare system due to the increased resources and personnel employed in the main operating room (OR).[3] By negating the need for sedation or general anesthesia in an OR setting, the costs associated with preoperative testing, intravenous insertion, intraoperative monitoring, the postoperative anesthetic care unit, and associated staff are eliminated by use of the WALANT technique.[1]

A prior study from Canada, evaluating cost effectiveness of the WALANT technique for carpal tunnel release, found that twice as many carpal tunnel releases could be performed at one quarter the cost by performing the surgery

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in minor procedure rooms compared with main ORs.[4] There is also evidence that patients undergoing WALANT hand surgery have equal satisfaction compared to those who undergo traditional tourniquet surgery due to avoidance of nausea and vomiting, decreased urinary retention and sedation-induced dizziness, increased independence due to lack of need for an escort following surgery, and greater efficiency due to a need for fewer preoperative visits.[5] Several other groups have also studied similar topics.[6,7]

The WALANT technique has myriad applications in hand surgery today. Descriptions exist for its use in tendon repairs, transfers, grafting, tenolysis, open reduction and internal fixation of hand fractures, joint fusions, arthroplasties, dupuytren's contracture releases, and carpal tunnel releases.[8,9]

Here, we aim to analyze the cost savings and efficiency of performing A1 pulley release for treatment of trigger finger using the WALANT technique in a major city teaching hospital procedure room as compared with the standard tourniquet, OR approach.

METHODS

Patients who underwent trigger finger release either in the main hospital OR or procedure room between 2012 and 2017 were identified for retrospective paper and electronic chart review. Both paper and electronic medical records were reviewed, and patient demographics were collected, including age, body mass index, smoking status, and medical comorbidities. The history of the presenting problem including chief complaint and prior treatment (including conservative management) was noted. Additionally, procedural information was obtained including date of surgery, procedure site and length of operation, amount of local anesthesia used, turnover time, and cost of supplies utilized.

Patients were followed for an average of 82 days in the procedure room group and 242 days in the OR group, with postoperative complications noted. In the procedure room, release was performed as described by Dr. Lalonde: 26 minutes before the procedure, the hand was prepped in standard fashion using an antiseptic solution. A mixture of 1% lidocaine with 1:100,000 epinephrine and 8.4% bicarbonate is then injected subcutaneously through a 27-guage needle, beginning in the palm and then working distally along the planned incision to allow for maximal vasoconstriction.[1,8,9]

Analyzed costs included costs paid by our public hospital center. We chose to analyze costs that differed between the procedure room and OR, given that absolute costs of staff and personnel were not readily available. For example, we utilized a conglomerated cost that accounted for cost of anesthesiologist and OR staff not required in the procedure room. This is further detailed in the results section. All descriptive statistical analyses and nonparametric Mann-Whitney *U* tests were performed using IBM SPSS (Version 23; IBM Corp., Armonk, NY).

RESULTS

Between October 2012 and April 2017, 76 A1 pulley releases were performed (39 in the procedure room and 37 in the OR). The procedure room and OR groups were comparable with regards to mean age (57 years versus 57 years, respectively; $P = 0.275$) and body mass index (28.8 versus 30; $P = 0.61$). While patients in the OR group had a higher rate of smoking compared to those in the procedure room group, the difference was not statistically significant (3.13% versus 12.5%; $P = 0.162$). Thus, both groups of patients appeared to be quite comparable to one another (Table 1).

Table 1. Demographics of Procedure Room Patients Versus Operating Room Patients

Demographics	Procedure Room	Operating Room	*P*
Mean age (y)	57	57	0.275
BMI	28.82	30	0.61
Smoker	3.13%	12.50%	0.162

BMI indicates body mass index.

Table 2. Distribution of Sedation Types Used in the Operating Room Cohort

Operating Room Analgesic/Sedation Technique		
Local only	23	62.16%
MAC	11	29.73%
LMA	2	5.41%
General endotracheal	1	2.70%

Patients in the procedure room received solely local anesthesia, while patients in the OR received local anesthesia (62.16%), MAC (29.73%), LMA (5.41%), or general endotracheal intubation (2.70%) with tourniquet (Table 2). In both the procedure room and OR, each finger requiring release was treated with an average of 7.95 and 7.69 cc of local anesthetic, respectively ($P = 0.767$).

When evaluated for length of operation, cases performed in the procedure room were comparable to procedures performed in the OR (21.4 ± 7 versus 23.5 ± 14.3 minutes, respectively; $P = 0.942$). Similarly, procedure room turnover time was approximately half the OR turnover time, of statistical significance (31.1 ± 11.1 versus 65.3 ± 17.7 minutes, respectively; $P < 0.001$). Therefore, total time, defined as length of procedure plus turnover time, was on average over 35 minutes greater in the OR group when compared to that in the procedure room group.

When evaluated for overall cost of procedure, including cost of OR time, necessary instruments, and staff, cases performed in the procedure room were of significantly lower cost compared with those in the main OR. The cost of instruments utilized for trigger finger release in the procedure room was over one third less than the cost of the instruments utilized for the same case in the main OR ($993.79 versus $3,304.25; Tables 3 and 4) Second, the cost per minute for all personal services was calculated to be $44 more expensive per minute spent in the main OR when compared to that in the procedure room, given the minimal number of the OR personnel present in the latter. Additional costs were calculated by using average length of procedure, instrument cost, and the aforementioned value for staffing cost per minute.

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Table 3. Names and Costs of Items Included in the Procedure Room Instrument Tray

Item Name	Quantity	Cost
Foerster forceps	2	$22.56
Backhaus forceps	4	$24.48
Halstead forceps 5 CVD	6	$38.34
Halstead forceps 5 STR	2	$12.66
Carb-Bite Halsey	2	$73.62
Beasley-Babcock tissue forceps	2	$90.16
Adson Dress forceps	1	$7.42
Adson Tissue forceps	2	$15.68
Jewelers forceps	1	$19.32
#3 knife handle	2	$10.08
Littler scissors	1	$36.00
Stevens Tenotomy	1	$22.29
Mayo scissors	1	$10.14
Johnson single hook	2	$76.14
Ragnell	3	$48.75
Freer/elevator	1	$19.04
Gerald BIPOLAR	1	$135.79
Blumenthal rongeur	1	$89.59
Iodine cup	1	$10.44
Medicine cup	1	$14.72
Rongeur	1	$216.57
Total	38	$993.79

Table 4. Names and Costs of Items Included in the Operating Room Instrument Tray

Item Name	Quantity	Cost
Iris scissors	2	$83.56
Littler scissors	2	$72.00
Stevens Tenotomy CVD	1	$25.34
Stevens Tenotomy STR	1	$24.32
Strabismus scissors CVD	1	$22.84
Strabismus scissors STR	1	$21.78
Adson Tissue forceps	2	$15.68
Adson Tissue forceps DEL	2	$19.46
Adson Dress forceps	2	$17.26
Beasley-Babcock tissue forceps	2	$90.16
Jewelers forceps	2	$38.64
Bishop-Harmon forceps	2	$93.70
Jewelers bipolar forceps	1	$131.44
Kleinert-Kuts skin hook (3 mm)	2	$41.62
Kleinert-Kuts skin hook (5 mm)	2	$41.62
Joseph double hook (7 mm)	2	$42.04
News tracheal hook	2	$47.04
Castroviejo lacrimal dilator	1	$10.82
Senn retractor sharp	2	$21.72
Ragnell	2	$32.50
#3 knife handle	2	$10.08
#3KS knife handle	1	$23.95
Woodson dura separator	1	$45.69
McKenty septal elevator	1	$28.19
Joseph periosteal elevator	1	$29.12
Freer/elevator	1	$19.04
Mini-Hohmann retractor (4 × 6 mm)	2	$45.68
Mini-Hohmann retractor (4 × 8 mm)	2	$45.68
Frazier suction tube	1	$16.75
Mayo scissors STR	1	$10.14
Mayo scissors CVD	1	$13.15
Metzenbaum scissors	1	$19.18
Carb-Bite Webster NH	2	$73.62
Carb-Bite Halsey NH	2	$73.62
Carb-Bite Mayo-Hegar NH	2	$68.82
Petit-Point Mosquito	4	$97.08
Halstead forceps 5 CVD	4	$32.60
Halstead forceps 5 STR	2	$15.98
Crile forceps	1	$6.66
R-Pean forceps	1	$9.85
Allis tissue forceps	2	$28.34
Ochsner forceps	1	$9.10
Kocher forceps	2	$24.84
Meeker clamp	2	$56.28
Petit-Point Mixter forceps	2	$67.72
Backhaus forceps (5-1/4)	4	$24.44
Backhaus forceps (3-1/2)	4	$24.48
Foerster forceps	4	$57.00
Bruns Curette (Size 00)	1	$32.86
Bruns Curette (Size 1)	1	$32.86
Bruns Curette (Size 2)	1	$32.86
Jarit Bone Hook	1	$43.31
Richardson	2	$40.88
Weitlander retractor (4-1/2)	2	$122.92
Weitlander retractor (5-1/2)	2	$128.52
Friedman rongeur	1	$85.61
Blumenthal rongeur	1	$89.59
Jarit-Ruskin rongeur	1	$177.42
R-Liston Cutt forceps	1	$162.49
Wire-cutter	1	$364.69
Medicine cup	2	$29.44
Sharp Jarit retractor	1	$45.09
Blunt Jarit retractor	1	$45.09
Total	107	$3,304.25

A1 pulley release of a single trigger finger completed in the OR was found to be $3,344.46 more expensive than if the same trigger finger was to be released in the procedure room. This indicates a resulting 77% decrease in cost per trigger finger release completed in the procedure room when compared with the main OR.

Importantly, there was no difference in intraoperative and postoperative complication rates between the 2 groups. Each group demonstrated one case of persistent postoperative paresthesia (2.7% versus 2.7%; $P = 0.985$). Notably, there was no statistically significant difference in postoperative infection rates between the 2 groups, with 2 postoperative infections in the procedure room group versus no postoperative infections in the OR group (0%). Lastly, rates of incomplete pulley release or recurrence of triggering were similar between the 2 groups, with 2 procedure room patients (5.13%) and 1 OR patient (2.7%) demonstrating recurrent postoperative triggering ($P = 0.572$). No wound healing complications were identified in either group (Table 5).

DISCUSSION

Over the past decade, physicians across various surgical specialties have increased their efficiency by performing outpatient procedures in an ambulatory setting. While hand surgery historically required the use of a tourniquet and anesthesia for adequate visualization of the operative field, application of the WALANT technique negates the need for tourniquet, allowing for adequate hemostasis and visualization by the use of properly administered and timed local anesthesia. In this manner, ambulatory hand surgery may be performed in the outpatient setting.[9]

While it was originally believed that injection of epinephrine into the finger would lead to ischemia and eventual necrosis due to its vasoconstrictive and hemostatic properties, this belief has since been overturned due to a number of completed prospective clinical studies demonstrating its safety.[2,10] Additionally, it has been shown that finger infarction does not occur even in the case of accidental injection of high-dose epinephrine (1:1,000), thereby rendering it unlikely that low-dose epinephrine (1:100,000) would result in ischemia.[11] Most importantly, there have been a greater number of cases of digital infarction reported secondary to improper use of digital

Table 5. Complications Suffered by Both the Operating Room and Procedure Room Cohorts

Complications	Procedure Room	Operating Room	*P*
Infection requiring antibiotics	1	0	0.321
Infection requiring incision and drainage	1	0	0.321
Delayed wound healing	0	0	–
Persistent paresthesia	1	1	0.985
Incomplete release	2	1	0.572

tourniquets than reported following the use of lidocaine and epinephrine solutions.[12]

Existing literature describes the recommended protocol for trigger finger release using the WALANT technique. By following Dr. Lalonde's recommendations in our 39 procedure room patients, we were able to demonstrate that the procedure is both reproducible and can be safely and efficiently performed in a large teaching hospital setting with very little morbidity. Our results demonstrate that utilization of the WALANT technique for A1 pulley release in the treatment of trigger finger allows for more efficiency and greater cost savings, with decreased procedure time, approximately one half the turnover time and over one third the cost of instruments utilized, with no increase in overall complication rates.

Additionally, in the setting of an academic medical center's teaching hospital, it is possible that the increase in patient communication during the procedure and the patient's ability to perform exam maneuvers comfortably during the procedure could facilitate a more complete pulley release, thereby minimizing the need for reoperation.[8,9,13] In our cohort, only 1 procedure room patient and 1 OR patient were required to undergo A1 pulley rerelease.

The cost effectiveness of this technique has been previously reported in the literature.[4,14–19] Specifically, a study by Leblanc et al[4] out of the Department of Plastic Surgery at Dalhousie University in Canada showed a quadruple in cost when carpal tunnel release was completed in a main hospital rather than in an ambulatory setting. Second, a study from the Dartmouth Hitchcock Medical Center relayed similar results with regards to CTR and further described a profit per case of $1,186 for procedures completed in the clinic and a net loss of $650 for procedures completed in the main hospital.[14] Lastly, a study from the United Kingdom demonstrated $3.2 million in savings after minor hand surgery was performed on the first 1,000 wide-awake surgery patients.[15]

Our study is not without limitations. Given the single-center nature of this study, our data is likely to be biased with regards to all of the parameters that were collected and analyzed (complication rate, type of complication, etc). Additionally, our cohort is a small one considering our stringent inclusion criteria and exclusion of patients with incomplete medical records. A power analysis reveals a cohort of 64 is required for our study groups to be powered. However, despite this, we firmly believe that our study adds even greater evidence into the hand surgery literature in favor of the WALANT technique.

Overall, the data procured from the patient population treated at our public hospital suggest that procedure room–based treatment of trigger finger is less costly than release in the OR. Our study contributes to this growing body of literature in support of procedure room–based surgery utilizing the WALANT technique, with a novel focus solely on A1 pulley release for the treatment of trigger finger in a major city teaching hospital.

CONCLUSION

Our study demonstrates that performing an A1 pulley release for treatment of trigger finger using the WALANT technique is both cost effective and time efficient compared to performing the same procedure in the main OR of a major city public teaching hospital.

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