Operating on a Stretcher is a Safe Alternative to An Operating Room Table

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Abstract

Purpose:

The primary purpose of this study was to compare intraoperative and post-operative complication rates for upper extremity surgical cases performed on a standard operating room (OR) table with similar cases done on a typical hospital stretcher. Secondary measures reviewed included surgical time, turnover time, total OR time, blood loss, tourniquet time, and postoperative complications.

Methods:

Using our institution's electronic medical record system, we reviewed 100 consecutive upper extremity cases performed on a stretcher as well as 100 consecutive upper extremity cases done on a standard OR table. All cases were performed by the same board certified, fellowship trained orthopaedic surgeon. The cases were performed between February of 2014 and May of 2016 at a level one trauma center and its associated outpatient surgical center. Basic univariate statistical analyses were performed, and the two groups were compared for primary and secondary outcome measures.

Results:

The data showed no significant increase in intraoperative complication rates

when operating on a standard hospital stretcher compared to operating on an OR table. There were a total of 6 postoperative complications in the stretcher group and a total of 11 complications in the OR table group. The most common postoperative complication seen in both cohorts was infection. There was one intraoperative complication in the OR table group and none in the stretcher group. With regard to total operating room time, surgical time, and delta time (overall OR room time minus surgical time which was used to calculate the turnover time), we found that the OR table group had shorter times in each category. The total OR time for the OR table group was a mean time of 105 minutes compared to 146 minutes seen in the stretcher group ($p= 0.0002$). Similarly, there was a shorter mean surgical time for surgeries done on an OR table (73 minutes) when compared to surgeries done on a stretcher (104 minutes) ($p = 0.0026$). Finally, the average turnover time (delta time) for the OR table group was 32 minutes while the average turnover time for the stretcher group was 42 minutes ($p= 0.0002$). The average tourniquet time for the OR table group was 36 minutes as compared to 41 in the stretcher group ($p=0.467$).

Conclusion:

Operating on a typical hospital stretcher is a safe alternative to operating on a standard operating room table as there was no increased complication rate seen with surgeries performed on a stretcher compared to an OR table.

Level of Evidence:

Level 3 evidence

Introduction

Concern about patient outcomes with regard to patient positioning were brought about by our hospitals administration and led to concern about the viability of operating on a stretcher versus standard OR table. The primary purpose of this study was to describe the technique for operating on a standard hospital stretcher and to investigate the possibility of increased complication rates with stretcher use compared to operating on a standard operating room table.

Methods

After Institutional Review Board authorization was obtained, we analyzed our institution's electronic medical record system and reviewed a total of 200 consecutively done supine hand and upper extremity surgical cases done between February of 2014 and May of 2016 at our level one trauma center and its associated outpatient surgery center. The start date for data collection for these surgeries was determined by when the operating surgeon began performing hand and upper extremity surgeries on a stretcher, which had previously not been done at this institution. One hundred consecutive cases done on a hospital stretcher and one hundred consecutive cases done on a typical OR table were reviewed and data was collected. All surgeries were performed by the same board certified, hand and upper extremity fellowship trained surgeon.

If the case was booked on an OR table, then either a Birchold, Jackson, or Maquet operating table was used based on surgeon preference and table availability. A hand table was attached to the OR table using clamps. At the conclusion of the procedure, the patient was extubated and then transferred back from the OR table to the stretcher, and then transported to the recovery room. If the procedure was on a stretcher the patient would undergo all anesthesia and operative intervention on the stretcher with the addition of a hand table under the padding.

Study Groups:

The patients were stratified into groups based solely on the operative surface the patient was lying on: OR table vs hospital stretcher. There were no exclusion criteria for age, sex, comorbidities or type of procedure. The OR table group consisted of 100 consecutive patients who underwent both elective or emergent surgery on a standard operating room table at either our level 1 trauma center or its affiliated ambulatory care outpatient surgery center. The second group consisted of the first 100 patients who had elective or emergent surgery performed on a typical hospital stretcher. Of those 100 patients, during chart review, 8 charts were found to have inconsistencies within the electronic medical record on whether the surgery was done on a stretcher or an OR table and those patients were excluded. After exclusions, this left a total of 92 patients in the stretcher group. This left us a total cohort of N = 192 patients.

Data and Statistical Analysis:

The data collected was done via our institutions electronic medical record. Simple analysis of means was used to compare the means between the groups for surgical time, total OR time, turnover time, blood loss and complication rates. Once the averages were calculated, they were compared using a Paired T test with statistical significance set at 0.05. Univariate analyses were conducted using Fisher Exact Tests for categorical comparisons and Independent t-tests for comparisons of continuous variables. An a priori power analysis using a Chi-Square Goodness-of-Fit test, with a moderate effect size (w = 0.25), alpha probability = 0.05, and degrees of freedom = 1, determined the minimum sample required for sufficient power (1-b = 0.8) is N = 126.

Results

Demographic comparisons were conducted to determine if there were differences between the groups based on age, sex, or race (Table 1). No differences were identified with respect to age or race; however, the stretcher group did have a larger proportion of male patients compared to the OR table group (79% vs 62%). This can be explained by the fact that the stretcher group did have a greater number of trauma patients. There were 51 trauma patients in the stretcher group compared with 25 in the OR table group ($p<.001$), Historically, trauma patients are more commonly male[7] which could explain the disproportion of male versus female between the two groups.

Table 2 is a summary of all complications that were seen in both study groups. It should be noted that there was one intraoperative complication in the OR table group, which was a transient traction neuritis of a digital nerve that resolved post-operatively. There were no intraoperative complications in the stretcher group. There was a total of 11 postoperative complications in the OR table group and 6 in the stretcher group ($p = 0.359$). The most commonly seen postoperative complication was infection with 5 acute infections occurring in both groups with only one of these requiring a reoperation. All other infections involved a superficial infection that resolved with good hygiene and oral antibiotics. Other complications seen in the OR table group were continued paresthesias in solitary digits in 3 patients. Unfortunately, each of these patients were lost to follow up and we were unable to determine if there was any resolution of their symptoms. There were also 2 patients in the OR table group that developed eschars on the operative extremity that were discovered at the first follow up visit. There was one trauma patient that had an acute both bone forearm fracture that had an ulnar shaft nonunion complication in the OR table group. This required a reoperation which was performed on a hospital stretcher. This Fracture did heal after autologous bone grafting and revision fixation. In addition to the five infections in the stretcher group, there was one other complication in the hospital stretcher group. There was a flexor tendon re-rupture after repair, which was the result of the patient failing to follow postop protocol. This patient had a second surgery performed on a stretcher for a secondary repair and went on to have the tendon heal with satisfactory results.

Mean time variables reviewed included total OR time, surgical time, turnover time, and tourniquet time (table 3). Evaluation of these variables found that the OR table group had an overall shorter average time at all endpoints. The mean total OR time for the OR table group was 105 minutes per case while the

stretcher group averaged 146 minutes per case (p= 0.000). The average surgical time showed similar results. A case performed on a standard OR table had a mean surgical time of 73 minutes while a case performed on a typical hospital stretcher had a mean surgical time of 104 minutes (p = 0.003). The mean calculated turnover time for a case done on an OR table was 32 minutes compared to 42 minutes when done on a stretcher (p= 0.0002). Mean tourniquet time for the OR table group was 36 minutes, while cases done on a stretcher had an average tourniquet time of 41 minutes (P = .4672). Although table 3 showed that there was a trend towards increased blood loss in the stretcher group when compared to the OR table group (12.8 cc's vs 7.7cc's), this did not reach clinical or statistical significance (p= .182),

Discussion

At our institution, Orthopaedic surgical cases including hand and upper extremity surgeries have historically been done on a standard operating room table with a "clamp on" hand table. This was because of a concern that there would be an increase in intraoperative and postoperative complications if other types of equipment, such as stretchers and adjustable hand tables, were used. The primary purpose of this study was to examine the complication rates of surgical procedures done on a standard OR table versus similar procedures done on a typical hospital stretcher. Our study of 192 consecutive patients showed no statistically significant increase in either intraoperative or postoperative complication rates when cases were done on a typical hospital stretcher compared to an OR table.

One of the common cited concerns for operating on a stretcher is the possibility of neck or back pain as well as pressure ulcers due to decreased padding on stretchers. While conducting this study, we inspected the padding thickness of several of the Stryker stretchers that are used for surgical cases done at our institution. This was done by measuring the thickness of the padding measurer on twenty different Stryker stretchers. The measurements for the padding was consistent with an average thickness of 65-70mm. We then compared this to the average thickness of 20 standard OR tables used at our institution and found that their average thickness was less than that of the stretchers with a thickness of 60-65mm. There were a total of ten infections in our study population with five infections seen in each study group. Only one of these infections required a secondary operation. This patient, which was in the OR table group, returned to the operating suite for an irrigation and debridement, after which, the infection resolved. The other nine cases were all treated successfully with oral antibiotics and local wound care and did not require a second surgery. A possible explanation for the similar infection rates seen between these two groups is because the antibiotic regimen and sterilization techniques used at our institution for both groups is the same. All patients undergoing a surgical procedure are treated with similar preoperative and postoperative antibiotics, as well as the same preoperative skin preparation and sterile draping techniques.

Secondary outcome measures that were evaluated included total operating room time, surgical time, and calculated turnover time. All time variables were decreased with

procedures done on an OR table when compared to procedures done on a stretcher (Table

3). It did seem counterintuitive that all time values were less in the OR table group compared to the stretcher group because there is normally some additional time needed for patient transfer when operating on an OR table. One possible explanation for this is the large amount of heterogenicity regarding the types of surgical cases that were done between the two groups. A closer examination of the data revealed that the majority (51 out of 92) of the cases that were initially done on a stretcher at our institution were not elective cases, but rather trauma cases. The majority of these trauma cases are done the same day and are on patients that have been directly transported from the emergency department to the preoperative area and then to the OR suite.

There are several reasons why trauma patients would be expected to have higher average times in the OR when compared to elective cases. One reason is that traumatic cases are more complex injuries which will require more actual surgical time in the OR. Table saw injuries, gunshot wounds, and high energy trauma such as motorcycle crashes are all injuries commonly seen at our level one trauma center and are subsequently referred to the hand and upper extremity service. These injuries require more time doing the actual procedure than an elective case such as an extra-articular distal radius fracture or carpal tunnel release. Similarly, another reason deals with the actual operating theatre itself. Because trauma patients have more complex injuries, they often require more specialized equipment in the OR suite. Examples of this would be a standard C-arm vs a mini C-arm, cell saver for blood loss, pulse lavage, and an operating microscope for revascularization and replantation cases. Similarly, the more complex the case, the more surgical trays are needed for specific instruments. The set up and take down of this equipment during room turnover would be expected to increase all average time points in the OR. We believe that the large amount of heterogenicity between our study cohorts has skewed our results. A study examining a more homogenous group of patients, with respect to elective cases vs trauma cases, as well as specific procedure type, would allow for a more accurate representation of surgical and turnover times between surgical procedures done on a stretcher vs an OR table.

This study has several limitations. First, this is a retrospective study which means that the study populations may not reflect the normal patient population, this is typical of retrospective studies because the patient selection is not able to be randomized. As is exemplified in our study where we selected the first 100 patients who we performed surgery on a stretcher and matched them against patients who underwent traditional OR table surgeries in the same timeframe. Another flaw of retrospective studies is that patient follow up is key for accurate data analysis. Another potential limitation is the lack of standardization regarding anesthesia during the surgical cases. There were several different types of anesthesia including general with intubation, general with a laryngeal mask airway, local monitored anesthesia care (MAC), and local only. Each of these different types of anesthesia have different associated induction and activation times as well as different times for reversal. Standardization of specific types of anesthesia, as well as the anesthesiologist administering the anesthesia, would have important effects on surgical and turnover times. Another limitation is the heterogeneity of the patient population with regard to surgical case type. As described earlier, closer inspection of our data showed that 51 out of 92 of the surgical cases done on a stretcher were trauma patients which tend to have longer surgical and turnover times. This is a confounding variable which unfortunately could not be

controlled due to the retrospective nature of the study. A study with two groups that were more similar regarding elective nature or specific type of surgical case would be a more accurate representation of surgical and turnover times.

To our knowledge, this is the first study of its kind to compare complication rates regarding two different operating room surfaces. The results of this study showed that at our institution operating on a stretcher when compared to a standard OR table has no increased risk for either intraoperative or postoperative complications. Although our data showed that there may be an increase in surgical and OR times when operating on a stretcher for trauma related patients, the results showed that operating on a stretcher is a safe alternative to operating an OR table. Future studies will be needed to further establish If operating on a stretcher actually leads to longer OR times and turnover times.

Abbreviations

Operating Room (OR)

Monitored Anesthesia Care (MAC)

Declarations

Ethical approval and Consent to Participation: Ethical approval and consent to participate were obtained through an IRB approval through Orlando Health in addition to Florida State University College of Medicine. As this study was a retrospective chart review and all patient information was withheld no formal consent was obtained from individual patients.

Consent for Publication: not relevant.

Availability of data and materials: Raw data was generated at Orlando Health. Derived data supporting the findings of this study are available from the corresponding author Chris Garrett, MD on request.

Competing interests: We have no competing interests to disclose.

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Authors' Contributions: As the corresponding author for this project my contributions included performing the chart review, compiling data, running statistical analysis, in addition to writing and editing the final manuscript. Dr. Neal was also instrumental in obtaining information through chart review and helped with writing the manuscript. Dr. Lewellyn's contributed to the project by overseeing the duties in addition to performing edits on the manuscript.

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Tables

Table 1. Demographic Comparisons

	OR Table **N = 100**	**Stretcher** **N = 92**	**Statistical** **Significance**
Age Mean (St.Dev)	44.9 (18.9)	47.4 (15.9)	p = .326
Sex (% Male)	61.6%	79.3%	p = .007
Race			
White	43.0%	51.0%	p = .134
Black	15.0%	20.4%	
Other	42.0%	28.6%	

Table 2. Complications

Complication	OR Table N = 100	Stretcher N = 92	Statistical Significance
Nerve Injury	3	0	p = .247
Infection	5	5	p = 1.000
Extremity Ulcer	2	0	p = .498
Miscellaneous	1	1	p = 1.000
Total Complications	11	6	p = .359

Table 3. Time Variables & Blood Loss

Mean Times	OR Table N = 100	Stretcher N = 92	Statistical Significance
Total Time in OR			
Mean (St.Dev)	105 (59.7)	146 (91.7)	p = 0.000
Length of Surgery			
Mean (St.Dev)	73 (54.5)	104 (87.1)	p = .003
Delta Time			
Mean (St.Dev)	32 (10.9)	42 (19.8)	p < 0.000
Tourniquet Time			
Mean (St.Dev)	36 (43.6)	41 (44.7)	p = .467
Estimated Blood Loss			
Mean (St.Dev)	7.7 (20.7)	12.8 (32.8)	p = .182