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Sage wisdom or anecdotal dictum? Equivalent opioid use after open, laparoscopic, and robotic inguinal hernia repair☆

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ABSTRACT

Background: Purported benefits of minimally-invasive inguinal hernia repair techniques include less postoperative pain, but objective data is lacking. We analyzed prescribing habits and opiate requirements to provide an objective comparison.

Methodology: Inguinal hernia repairs performed on patients aged 18–65 from October 2016 through February 2018 were examined. Patients with prior opiate use or complicated operative courses were excluded. Discharge prescriptions, morphine milligram equivalents(MME), and additional prescriptions within three months were evaluated.

Results: 173 patients met criteria including 90 open(OMR), 34 laparoscopic(TEP), and 49 robotic(RTAPP) repairs. There was no difference in age or gender. There was no difference in average opiate prescriptions(OMR 230 MME, TEP 229 MME, RTAP 208 MME; $p = 0.581$), percentage prescribed acetaminophen(OMR 96.7%, TEP 97.1%, RTAPP 98.0%; $p = 0.910$), or percentage prescribed NSAIDs(OMR 43.3%, TEP 44.1%, RTAP 46.9%; $p = 0.919$). On follow up, there was no difference in repeat opiate prescriptions(OMR 10.0%, TEP 8.8%, RTAPP 8.2%; $p = 0.934$).

Conclusions: Patients undergoing open, laparoscopic, and robotic inguinal hernia repairs showed no evidence of differing pain medication requirements. The implication that minimally-invasive techniques cause less pain may be inaccurate.

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Introduction

Current trends in surgery are prioritizing minimally invasive approaches as we seek to perform ever more complex maneuvers through smaller surgical footprints. While some advances have become standard of practice, others have yet to demonstrate superiority in clinical outcomes. Laparoscopic and robotic inguinal hernia repairs have gained increasingly popularity in the treatment of uncomplicated inguinal hernias. This is due, in large part, to the subjective improvement in patient experience with studies suggesting that patients return to usual activities of social life sooner with laparoscopic repairs.[1,2]

Multiple prospective randomized trials have directly measured return to work and restriction on physical activities after surgery. The largest American trial, the Veterans Affairs Cooperative Study randomized 1,983 patients to open or laparoscopic hernia repair. The time to the resumption of daily activities was four days for those undergoing laparoscopic hernia repair as opposed to five days for open repairs.[2] A 1999 study of 613 similarly stratified patients instead looked at full recovery. What they found was that laparoscopic repairs gained full recovery after 18.4 days as compared to 24.2 days for open mesh repairs ($p < 0.001$).[3] Since that time, myriad studies have demonstrated similar findings.[4,5]

A query of patient information available online from major institutions lists earlier return to activity as one of the many benefits of laparoscopic hernia surgery. While this is supported by multiple studies, multiple hospitals extrapolate to conclude that laparoscopic hernia repair results in less pain than the traditional alternative. Unfortunately, the evidence behind a reduction in pain is only supported by subjective data and anecdotal wisdom.

In a search for an objective measure we sought to evaluate prescribing practices and opioid needs after surgery to better

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elucidate the difference between patient recovery after open, laparoscopic, and robotic inguinal hernia repair.

As a Department of Defense-funded institution, all patients were covered by a no-deductible, zero-cost insurance plan. These benefits extend to all prescribed medications provided both inside and outside the facility. This system, thereby, captures all prescriptions, both opioid and nonopioid, during the queried period that were not paid for out-of-pocket. In addition, the lack of cost to the patient allows providers to prescribe medications commonly obtained over the counter.

Methods

Patient selection

We identified adult patients (18–65 years old) who underwent an inguinal hernia repair from October 2016 through February 2018 at a tertiary military medical center. A patient list was created by querying CPT codes in a regularly maintained hospital registry. After creating this list, a chart review was performed to obtain patient age, gender, comorbidities, laterality (or bilaterality), methodology (open v laparoscopic v robotic), operative course, and additional procedures within a 3 month period. Pharmacy analytics was then performed to create a list of all prescriptions from 6 months prior to the patient's date of surgery to 3 months after.

Patients undergoing repeat repair, those who underwent a conversion of method during their operation, or those who did not have complete medical records for the noted time period were excluded. After chart review, patients with an opioid prescription within the 6 months prior to their operation, patients requiring an inpatient stay greater than 24 h, patients with an operative complication requiring reporting to the Washington States Care and Outcomes Assessment Program (SCOAP), or patients requiring an additional procedure within the follow up window were also excluded.

Outcome measure

The primary outcome measures were initial postoperative opioid prescription and repeat opioid prescription within a 3 month period. All prescriptions were converted to Morphine Milligram Equivalents (MME) so as to standardize amongst opioid variants. Secondary outcome measures were[1] postoperative prescription of an NSAID medication,[2] postoperative prescription of acetaminophen, and[3] unilateral versus bilateral operation.

Statistical analysis

Patient demographics, disease, and operative characteristics were compared using Student's *t*-test for normal, continuous data. Chi-square test was used for categorical data. One way ANOVA testing was used to test the association between the method of hernia repair (open v laparoscopic v robotic) and the initial quantity of opioid prescribed postoperatively. One way ANOVA was also used to compare the need for repeat prescription amongst these methods. To test for an association between initial postoperative opioid prescription and need for repeat opioid prescription, we performed a Student's *t*-test. Two-tailed P-values are presented. An alpha level of 0.05 was used throughout. Data analysis was undertaken using SPSS 22 Software (IBM; Armonk, NY, USA).

Subgroup analysis

To control for differences in pain and prescribing habits related to unilateral versus bilateral inguinal hernia repairs, a subgroup analysis was performed for this data set. Patients who underwent a bilateral repair were excluded and statistical analysis was repeated as above.

Ethical approval

This study was conducted with approval from the institutional review board at Madigan Army Medical Center. A "safe harbor" third party was utilized for data collection. Study analysis was then performed on de-identified data.

Results

A total of 267 inguinal hernia repairs were performed during the study period and 173 patients met inclusion criteria. The study group was made up of 52.0% (90) open repairs with mesh (ORM), 19.7% (34) totally extraperitoneal (TEP) laparoscopic repairs, and 28.3% (49) robotic-assisted transabdominal preperitoneal (rTAPP) repairs.

Patients were more likely to have had a bilateral hernia repair with both TEP and rTAPP versus those undergoing ORM ($p < 0.001$). There was no statistical difference in regards to either age ($p = 0.764$) or gender ($p = 0.055$). At the time of discharge, 97.7% of patients were provided an opioid analgesic, ($p = 0.962$) the most common of which, in all patient populations, was oxycodone ($p = 0.907$) [Table 1].

The amount of opioid medication initially prescribed did not differ significantly between methodologies ($p = 0.581$). Likewise, the percentage prescribed acetaminophen (97.1%) and NSAIDS (44.5%) were statistically similar across the queried cohort. Within the 3 month follow up window, 16 patients (9.2%) required repeat opioid prescriptions and no difference was noted based upon the patient's method of hernia repair ($p = 0.935$). [Table 2].

Laterality-controlled subanalysis

Initial analysis demonstrated that a significantly higher proportion of patients undergoing TEP or rTAPP repairs received bilateral inguinal hernia repairs. To perform a matched cohort analysis, patients were excluded if they received a bilateral repair as part of their treatment. A total of 139 patients met inclusion criteria. The cohort was made up of 64% (89) ORM, 14.4% (20) TEP repairs, and 21.6% (30) rTAPP repairs.

Patients in this cohort who underwent ORM were more likely to be male than patients undergoing either TEP or rTAPP ($p = 0.010$). There was no statistical difference in regards to age ($p = 0.639$). [Table 3].

Table 1
Baseline characteristics and prescribing habits for patients undergoing inguinal hernia repair.

Variable	ORM	TEP	rTAPP	P Value
N	90	34	49	
Age	39.7 ± 14	40.8 ± 12	38.2 ± 11	0.764
Gender	97.8%	91.2%	87.8%	0.055
Bilateral	1.1%	41.1%	38.8%	<0.001
Prescribed an opioid analgesic	98.5%	97.2%	98.2%	0.962
Oxycodone	79.7%	83.3%	78.6%	
Percocet	15.0%	13.9%	17.9%	
Norco	3.8%	–	1.8%	
None	1.5%	2.8%	1.8%	

ORM - Open Repair with Mesh; TEP - Totally Extraperitoneal Repair.
rTAPP - Robotic Transabdominal Preperitoneal Repair.

Table 2
Initial prescription characteristics and repeat opioid requirements for patients after inguinal hernia repair.

Variable	ORM	TEP	rTAPP	P Value
N	90	34	49	
Initial Opiate Prescription [MME]	230.4 ± 122.3	229.4 ± 126.2	208.4 ± 123.6	0.581
Prescribed Acetaminophen	96.7%	97.1%	98.0%	0.911
Prescribed NSAID	43.3%	44.1%	46.9%	0.920
Required Repeat Opiate Rx	10.0%	8.8%	8.2%	0.935

ORM - Open Repair with Mesh; TEP - Totally Extraperitoneal Repair.
rTAPP - Robotic Transabdominal Preperitoneal Repair.

Table 3
Baseline characteristics and prescribing habits for patients undergoing unilateral inguinal hernia repair.

Variable	ORM	TEP	rTAPP	P Value
N	89	20	30	
Age	39.8 ± 14	41.6 ± 13	37.9 ± 12	0.639
Gender	97.8%	85.0%	83.3%	0.010
Prescribed an opioid analgesic	97.8%	95.0%	96.7%	0.803
Oxycodone	77.5%	80.0%	76.7%	
Percocet	19.1%	15.0%	16.7%	
Norco	1.1%	–	3.3%	
None	2.2%	5.0%	3.3%	

ORM - Open Repair with Mesh; TEP - Totally Extraperitoneal Repair.
rTAPP - Robotic Transabdominal Preperitoneal Repair.

Within this subgroup, there was a trend towards patients undergoing ORM being provided a greater amount of opioid medication with their initial postoperative prescription as compared to TEP and rTAPP, but this difference failed to reach statistical significance ($p = 0.454$). There was no difference in acetaminophen or NSAID prescribing habits ($p = 0.937$ and 0.666 respectively). As with the other study group, the percentage of patients requiring additional opioids did not differ significantly ($p = 0.807$). [Table 4].

Discussion

In summary, this study demonstrates that equal numbers of opioid and nonopioid analgesic medications were provided to patients following ORM, TEP, and rTAPP inguinal hernia repairs and, in addition to these initial prescriptions, an equal percentage of patients returned for additional opioids. If we accept the utilization of opioid medication as an objective measure of pain levels, this study offers objective data that the prevalence of moderate to severe pain after surgery is no different between ORM, TEP, and rTAPP inguinal hernia repairs.

This conclusion argues against multiple prior papers that have attempted to assess pain through subjective pain scales. A 2013 study of 613 patients randomized to receive either ORM or laparoscopic TAPP repair tried to use a Likert scale to quantify postoperative pain at 7 day and 8 week follow up. While they concluded that patients in the open mesh group reported more pain than those in the TAPP group ($p = 0.02$), they overlooked the fact that more patients noted moderate or severe pain after TAPP repair as opposed to open mesh repair (9.2% v 8.0%).[3] While this in and of itself does not assert the equivalency of ORM, the contrary data suggest that the four step Likert pain scale (none, mild, moderate, severe) may simply leave too much subjective grey area to draw meaningful conclusions.

Other studies have attempted to avoid the problems with a Likert scale by using a visual-analogue scale to assess postoperative pain.[1,6,7] The study by Neumayer et al. published in the New England Journal of Medicine utilized a pain assessment tool that was formulated to guide inpatient pain management strategies.[2] This tool plotted pain scores and was able to find statistical significance between the subject experience of pain in ORM versus laparoscopic TEP repairs both immediately postoperatively and at 2 week follow up. While offering greater variability from the structured categorical modeling of the Likert scale, the original authors of the visual-analog scale admit to its weaknesses stating "the reporting of pain is a social transaction between caregiver and patient. Therefore, successful assessment … of postoperative pain depends in part on establishing a positive relationship between healtch care providers [and] patients."[8] Within this relationship there is, therefore, a significant area of possible bias is the positive expectations of improved recovery felt by physicians. When a provider passes these expectations along to his/her patients, it increases the likelihood that a patient's subjective experience will be influenced accordingly.

The utilization of opioid prescriptions as a numeric way of assessing pain was a strength of this study, but also provided for its greatest limitation. While quantifying the need for a repeat opioid prescriptions captures the number of patients for whom the initial prescription was insufficient, the retrospective nature of this study fails to demonstrate additional granularity. As such, we are unable to identify and stratify patient opioid requirements below the level of the initial prescription.

The other important findings of note from this data is the general prescribing trend. While the preponderance of the evidence had previously suggested that open hernias involved greater

Table 4
Initial prescription characteristics and repeat opioid requirements for patients after unilateral inguinal hernia repair.

Variable	ORM	TEP	rTAPP	P Value
N	89	20	30	
Initial Opiate Prescription [MME]	230.5 ± 123.2	198.7 ± 116.1	205.4 ± 139.5	0.454
Prescribed Acetaminophen	96.6%	95.0%	96.7%	0.937
Prescribed NSAID	43.8%	55.0%	46.7%	0.666
Required Repeat Opiate Rx	9.0%	5.0%	6.7%	0.807

ORM - Open Repair with Mesh; TEP - Totally Extraperitoneal Repair.
rTAPP - Robotic Transabdominal Preperitoneal Repair.

postoperative pain, no more than a trend towards an increase in initial opioid prescription and repeat opioid prescriptions were reflected in the data. Moreover, all of the noted methods of hernia repair demonstrated very low levels of repeat opioid prescriptions. With the goal repeat rate reported to be less than 20%,[9] there appears to be room for safe and effective opioid reduction. One of the identifiable ways to improve postoperative pain control while minimizing opioid medications is by prescribing more NSAID analgesics. NSAIDS, such as ibuprofen and toradol, have received a reputation for increasing the risk of bleeding. While this is well described and scientifically supported in the setting of gastrointestinal ulceration,[10–12] elevated risk of postoperative bleeding has been an often passed down, but never validated theory. To the contrary, recent articles have come out stating that NSAIDs are, in fact, safe after surgery[11,13,14]. With this in mind, the fact that only 44.5% of the cohort received an NSAID prescription leaves significant room for greater nonopioid utilization.

Inguinal hernia repairs remain one of the most common general surgical procedures with more than 600,000 being performed annually in the United States.[15] While smaller incisions and newer technologies give us hope that we can perform more complicated procedures while causing less pain and producing less tissue damage, we should not be so quick to abandon the operations of the past. ORM remains an effective treatment for inguinal hernia. As with any procedure, a thorough risk/benefit analysis is warranted during the consent process. Providers should be confident that with appropriate counseling ORM, TEP, and rTAPP in the hands of a skilled operator are likely safe, equally effective, and appropriate for repair of a simple inguinal hernia with minimal, if any, difference in postoperative pain profile.

Conflicts of interest

The authors have no financial disclosures or conflicts of interest to report.

Disclosures

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