Wrong-Bone Excision in Hand Surgery

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HAND
2017, Vol. 12(5) 467–470
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DOI: 10.1177/1558944716672202
hand.sagepub.com

Abstract

Background: The incidence of wrong-bone excision in hand surgery is not known. The wrist offers a unique challenge in that a single surgical incision yields access to multiple potential surgical sites, thus rendering site marking less effective. Mistaken identification of structures in the wrist is a real and potentially troublesome phenomenon. This study is designed to evaluate the occurrence of wrong-bone excision and to identify any risk factors and preventative measures that may help to prevent this complication in the future. **Methods:** We designed an anonymous online survey to determine the occurrence, risk factors, medicolegal outcomes, and preventative measures of wrong-bone excision. We distributed the survey to 777 hand surgeons via email. **Results:** Ninety-nine surgeons responded to our survey. Twenty-three respondents had participated in an excision of the incorrect bone in the wrist. The most common error was partial or complete excision of the scaphoid during a planned excision of the trapezium. Respondents indicated that inadequate visualization, inadequate localization, and teaching of a resident or fellow contributed to the error. There was only 1 case of legal action. **Conclusions:** The results of our survey indicate that there exists a non-zero incidence of wrong-bone excision in hand surgery. The most common mistake is incorrect excision of the scaphoid during a planned trapeziectomy. Most surgeons feel that their patients were pleased with their outcome despite this complication, and legal action is rare. Deliberate identification of known landmarks was identified as the most useful strategy in preventing wrong-bone excision.

Keywords: hand surgery, medical errors, medical malpractice

Introduction

In 1999, the U.S. Institute of Medicine publication titled *To Err Is Human* identified wrong-site surgery as a serious and troublesome adverse effect in healthcare.⁶ By that time, the American Academy of Orthopaedic Surgeons (AAOS) had already embarked upon its “Sign Your Site” campaign that encouraged preoperative site-marking in order to reduce wrong-site errors. Currently, the Joint Commission Universal Protocol requires hospital procedures to include preprocedural verification, site-marking, and time-out prior to initiation of the procedure.⁵

Previous studies have identified the incidence and risk factors for wrong-site surgery in hand surgery^{4,8}; however, these studies do not address errors that can occur after incision has been made. The intricate relationships in the wrist can make identification of structures difficult. Recent discussion on the email Listserv of the members of the American Society for Surgery of the Hand (ASSH) has identified a non-zero incidence of excision of the incorrect bone in hand surgery (written communication posted to ASSH members email list-serv, January 28, 2015). We are unaware of any previous studies that have examined the incidence of this phenomenon. As such, we performed a survey study of hand surgeons to

determine the occurrence of wrong-bone excision, as well as to identify any risk factors and any preventative measures that may help to prevent this mistake in the future.

Materials and Methods

After approval by our institutional review board, we provided an anonymous online survey to 777 fellowship-trained hand surgeons. The survey was composed of 13 questions regarding surgeons’ experiences with wrong-bone excision. Initially, each respondent declared if they had directly participated in a surgery that resulted in a wrong-bone excision. Those who indicated that they had not were thanked for their time and asked no further questions. Those who indicated that they had experienced this mistake were subsequently queried regarding which bone was excised,

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Table 1. Survey Distribution Data.

Survey distribution and responses	n
Number of survey links emailed	777
Number of responses	99

Table 2. Planned Procedure and Bone Incorrectly Excised.

Planned procedure	Bone excised	n
Excision of trapezium—complete	Scaphoid excised	6
Excision of trapezium—complete	Trapezoid excised	1
Excision of trapezium with partial excision of trapezoid	Scaphoid excised	3
Excision of trapezium—partial	Scaphoid excised	1
Excision of distal pole of the scaphoid	Entire scaphoid excised	1

the procedure during which this occurred, any sequelae of the error, as well as the surgeon's thoughts regarding the patient's outcome. The survey remained open for 90 days, after which data collection concluded. Ninety-nine surveys were available for review. The survey utilized a commercial website (www.surveymonkey.com; SurveyMonkey Inc, Palo Alto, California) for survey distribution, data collection, and statistical analysis.

Results

Twenty-three respondents stated that they had participated in an excision of the incorrect bone in the hand or wrist, while only 12 of those who had experienced this phenomenon went on to complete the remainder of the survey (Table 1). The remaining 11 positive responses were excluded due to incomplete surveys.

The majority of cases resulting in wrong-bone excision occurred during a planned excision of all or part of the trapezium, while 1 case was a planned excision of the distal pole of the scaphoid. The most common incorrectly excised bone was the scaphoid, while 1 case involved incorrect excision of the trapezoid (Table 2). Respondents indicated that inadequate visualization, inadequate localization, inadequate retraction, and teaching of a resident or fellow contributed to the error. Three surgeons felt that abnormal or distorted anatomy played a role in the error (Table 3).

In 9 cases, the surgeon discovered the error intraoperatively and the planned procedure was completed. In the remaining 3 cases, the surgeon did not notice the error until the first follow-up visit. Eight patients were notified of the error, while 3 were never notified (1 respondent could not recall whether or not the patient was notified of the error).

In 11 cases of wrong-bone excision, a course of observation was undertaken after discovery of the mistake. One of

Table 3. Risk Factors for Wrong-Bone Excision.

Risk factor	n
Inadequate visualization due to limited exposure/incision	4
Inadequate localization	4
Error occurred while teaching resident/fellow	4
Distorted/abnormal anatomy	3
Inadequate retraction	1
Inadequate personal experience	1
Fluoroscopy unavailable	1

Table 4. Risk Reduction Strategies.

Risk reduction strategy	n
More deliberate identification of known landmarks	8
Changed technique of teaching resident/fellow during these procedures	3
Use of fluoroscopy	2
No change in technique	1

those patients was offered but declined intercarpal fusion, and cast immobilization for an unknown period was performed. No revision surgeries occurred. Eleven surgeons felt that their patients were pleased with their outcome regardless of the error committed. The remaining case resulted in settlement out of court.

Eight respondents stated that they now undertake more deliberate identification of known landmarks to prevent future occurrences, 7 of whom felt that this led to a major reduction in the risk of future wrong-bone excision. Three of the 12 changed the way that they train residents and/or fellows as a result of a wrong-bone excision. Other risk-reduction strategies included increased use of fluoroscopy and not starting the case until the fluoroscope and x-ray technician were in the room (Table 4).

Discussion

Wrong-site surgery has previously been identified as an uncommon yet potentially devastating complication in orthopedic surgery. In 1997, the AAOS formed the Task Force on Wrong-Site Surgery to address this problem.² Subsequently, the AAOS released an advisory statement that recommended surgeons place his or her initials on the operative site using a permanent marking pen and then operating through or adjacent to his or her initials.¹ This gave rise to the "Sign Your Site" campaign. Currently, the Joint Commission has implemented the Universal Protocol which requires preprocedural verification of the procedure and patient, site-marking, and time-out prior to initiation of the procedure.⁵

A survey study of orthopedic surgeons by Wong et al⁹ demonstrated that 5.6% of medical errors in orthopedic surgery

were wrong-site surgeries. Of those, the majority (70%) occurred in the hand and wrist. Fifty-nine percent of the wrong-site surgeries involved the wrong side while 23% involved the wrong location, such as the wrong finger on the correct side.

In a 2003 survey of members of the ASSH, 21% of respondents reported performing wrong-site surgery at least once.⁸ Analysis showed no difference in incidence between general, orthopedic, and plastic surgeons, or between those in academic versus private practice. The majority of those incidents occurred in the finger (63%) with a minority occurring at the wrist (9%). Nine percent of those errors led to permanent disability for the patient, and 38% led to legal action against the surgeon or a monetary settlement.

The risk factors for wrong-site surgery are varied. A 2003 study implicated the actions of the surgeon in the operating room in a majority of errors, including failure to verify site-markings and beginning the procedure before the time-out was complete.³ Others have demonstrated that site-marking ink is erased by chlorhexidine pre-op cleansing.⁷ The risk of wrong-site surgery in hand surgery appears to be directly related to surgical caseload.⁸

When performing surgery at the wrist, time-outs and site-marking may be of limited usefulness. As previously noted,⁴ site-marking tends to emphasize identification of the correct side, not necessarily the correct part. In addition, the wrist offers a unique challenge in that a single surgical incision yields access to multiple potential surgical sites, thus rendering site-marking less effective. Once the surgeon makes incision, the correct structures must still be identified. Mistaken identification of structures in the wrist is a real and potentially troublesome phenomenon.

In our survey, 23 hand surgeons stated that they have experienced excision of the wrong bone in the wrist. This proportion is consistent with previous studies regarding wrong-site procedures in hand surgery.⁸ The majority of incorrect excisions reported involved removal of all or part of the scaphoid during a planned trapeziectomy. One case involved excision of the trapezoid during trapeziectomy and 1 involved removal of the entire scaphoid during a distal pole excision. None of the cases required revision surgery, and only 1 case led to perceived patient dissatisfaction; that case was the sole case to result in monetary settlement.

Risk factors for wrong-bone excision identified by this survey include inadequate localization, inadequate visualization, teaching of residents/fellows, and abnormal or altered anatomy. The responding surgeons have adopted increased use of fluoroscopy, change in teaching technique, and more deliberate identification of known landmarks to prevent such occurrences in the future. All surgeons who have implemented changes in their practice felt more protected from future errors by the measures they have taken.

While our survey study is descriptive of a problem that we have not seen previously reported, it does suffer from some weaknesses. As a survey study, the data collected is subject to

recall bias. In addition, we had a small number of responses given the number of surveys sent out (99 of 777, 12.7%). Surgeons may be unwilling to report adverse events such as wrong-bone excision, or may be unwilling to share such data in an electronic format. In addition, the mechanism of distributing a survey via email is dependent upon the study's ability to correctly deliver the survey to its participants. We did not mandate that respondents disclose their individual level of participation in the wrong-bone excision; we felt that requiring such disclosure may limit participation in our survey and that little gain would come from such responses.

Our data show that, while it is not common, there exists a non-zero incidence of wrong-bone excision in hand surgery. However, the effects of this error may not be as deleterious as one might expect. Our respondents report a generally favorable outcome regardless of the error committed, in terms of both need for revision and patient satisfaction. Potential preventative measures include use of fluoroscopy, more deliberate identification of landmarks, and better supervision of residents and/or fellows.

We recommend that every hand surgeon remain cognizant of the fact that wrong-bone excision can happen. It is up to each surgeon to develop an algorithm to prove, in every surgical case, that he or she is not excising the wrong bone. We further suggest that the surgeon develop adequate exposure so as to rule out the possibility that an adjacent bone is being mistaken for the target bone. A low threshold should exist for utilizing fluoroscopy for confirmation before excising any bone.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

This article does not contain any studies with human or animal subjects.

Statement of Informed Consent

No identifiable personal data were gathered in this study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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