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Analysis of the reasons why patients cancel shoulder surgery despite recommendation

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Background: To determine the reasons and factors that contribute to the cancellations of shoulder surgeries at a tertiary referral center and to analyze the characteristics of these patients.
Methods: Patients scheduled for shoulder surgery from June 2017 to July 2019 were allocated to a surgery group (n=224) or a cancellation group (n=96). These groups were compared with respect to patient characteristics, types of surgery, distance from patient's home to the hospital, traveling time to the hospital, and waiting period before surgery. Reasons for cancellation and responses were acquired using a telephone interview and were subsequently analyzed.
Results: The cancellation group was older, had a less frequent history of trauma, and had a lower proportion of patients undergoing arthroscopic rotator cuff repair than the surgery group (p=0.009, p=0.014, and p=0.017, respectively). In addition, mean distance from the patients' homes to the hospital and preoperative waiting time were both longer in the cancellation group (p=0.001 and p<0.01, respectively). The most common reason given for cancellation was another medical condition (28.1%).
Conclusions: Older age, need for arthroscopic rotator cuff repair surgery, longer distance from the patient's home to the hospital, and longer waiting period significantly increased the chance of cancellation. The main reason for canceling surgery was a concurrent medical condition. Therefore, identification of other medical conditions in advance is an important consideration when surgeons recommend shoulder surgery to patients. Surgeons should also consider patient's age, type of surgery, distance from the hospital, and waiting time when assessing the possibility of surgery cancellation.

Keywords: Surgery cancellation; Rotator cuff repair; Shoulder arthroplasty; Shoulder instability; Interview analysis

INTRODUCTION

Operating rooms are one of the most important service areas in medical centers. These areas are costly to install and maintain and operator time is valuable. Therefore, use of these facilities needs to be managed effectively [1]. Physicians recommend surgery to thousands of patients for a variety of shoulder joint diseases, but patient cancellations are common and cause problems that most hospitals have yet to resolve satisfactorily. Wasted manpower, surgical tools, surgical time, and increased waiting periods are some of the major problems arising from cancellation. Psychological and economic implications for patients and patient

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family members are also common [2]. Therefore, efforts made to reduce cancellations are important to maximize the efficient use of hospital resources and patient satisfaction [3].

Previous studies have reported surgical cancellation rates of 5%–20%. This adequately demonstrates that rates vary greatly between hospitals [2-6] and those efforts are required to address the reasons and factors associated with cancellations [7]. The reasons for the cancellation of surgeries are various and include abnormalities discovered on the preoperative laboratory examination, inconvenience in scheduling, and age.

In this study, we investigated the reasons and factors that contribute to the cancellations of shoulder surgeries at a tertiary referral center to provide information for improving patient management systems. We hypothesized that patient demographics, distances from homes to the hospital, traveling time, and waiting times would be no different for patients that underwent surgery and those that cancelled.

METHODS

This study protocol and the questionnaire used were approved beforehand by the Institutional Review Board of Seoul National University Hospital (IRB No. 2001-028-1092). All patients gave consent for the purpose of this study.

Patient Selection and Surgical Indications

Patients who visited the Seoul National University Hospital shoulder outpatient clinic and were recommended for shoulder surgery from June 2017 to July 2019 were included in this study. Those who underwent shoulder surgery constituted the surgery group and those that canceled surgery comprised the cancellation group. Only three major elective surgeries (arthroscopic rotator cuff repair, arthroplasty, and instability surgery) were included. Emergent surgeries involving fracture or infection were excluded. A full-thickness rotator cuff tear in a patient <65 years old was as an indication for surgery. For partial-thickness tears, surgery was performed on high-grade tears after 6 months of conservative treatment without response. Reverse total shoulder arthroplasty was performed for cuff tear arthropathy and irreparable rotator cuff tears on patients over 65 years old. Anatomical total shoulder arthroplasty was performed for severe osteoarthritis, avascular necrosis of the humeral head, and post-traumatic arthritis. For anterior shoulder instability, the surgical indications were an age of <60 years, reproducible symptoms, and anatomically abnormal findings (e.g., Bankart lesion or Hill-Sachs lesion). There was no patient with multi-directional instability in either group. For the analysis, anatomical total shoulder arthroplasty and reverse total shoulder arthroplasty were treated as arthroplasties even though these procedures are performed for distinctive purposes and functions. Bilateral surgeries were analyzed based on initial surgery to prevent duplication. Phone interviews were conducted on patients in the cancellation group after examining electronic medical records. Patients who failed to answer three telephone calls were excluded.

A total of 278 surgeries were performed during the study period by a single shoulder surgeon (SHK). Fifty-one surgeries were excluded because of not being one of the three major elective surgeries. Only the initial surgeries performed on three patients that underwent bilateral arthroscopic rotator cuff repair were included to minimize statistical bias. This resulted in the inclusion of 224 patients in the surgery group. Among these patients, 168 patients underwent rotator cuff repair, 37 patients underwent arthroplasty, and 19 patients underwent instability surgery. One hundred and two patients canceled surgery, 58 patients who were scheduled for rotator cuff repair, 29 patients scheduled for arthroplasty, and nine patients scheduled for instability surgery. Six patients not scheduled for one of the three elective surgeries, and 14 patients who failed to answer the phone were excluded. These include nine patients scheduled for arthroscopic rotator cuff repair, four patients for arthroplasty, and one patient for instability. Thus, the responses of 82 patients that canceled were analyzed (Fig. 1).

Data from candidates for arthroscopic cuff repair were analyzed separately; 58 canceled and 168 underwent surgery. However, no pre-operative MRI was available to determine global fatty degeneration index (FDI) or tear size in two patients who underwent surgery or in 17 patients who canceled the surgery. Therefore, data from 41 patients who canceled and 166 patients who underwent surgery were analyzed with respect to global FDI and tear size.

Patient Factors

Age, sex, laterality of the affected shoulder, history of trauma, revision surgery (when surgery was performed on the same shoulder), and contralateral limb surgical history in the cancellation and surgery group were analyzed. History of trauma was defined as a history of fall onto outstretched hand injuries, direct contusion injuries, traction injuries, and dislocation injuries. History of contralateral surgery was defined as history of surgery on the opposite shoulder regardless of the type of surgery and institution at which the surgery was performed.

Distance from Hospital, Traveling Time, and Waiting Periods

Distance from home to hospital and traveling time by public

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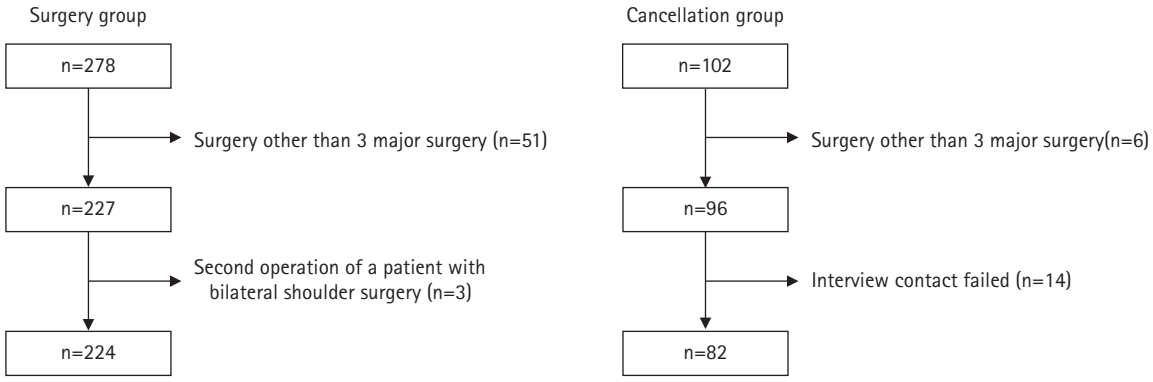

Fig. 1. Schematic of patient selection.

transport from home to hospital were evaluated using a map application (Kakaomap; Kakao Co., Jeju, Korea). Distances from hospital were categorized as 11–20, 21–50, 51–100, and >100 km; and traveling times were categorized as <30 minutes, 30 min to 1 hour, 1 to 2 hours, 2 to 3 hours, and >3 hours. Waiting time was defined as time from the last outpatient visit to the scheduled surgery.

Analysis on Type of Surgery Specificity

Patients in the surgery and cancellation groups that underwent the three types of surgery were compared by surgery type (arthroscopic rotator cuff repair, shoulder arthroplasty, or surgery for shoulder instability). We compared global fatty degeneration indices, tear sizes, and preoperative shoulder stiffness in the cancellation and surgery groups for arthroscopic rotator cuff repair. Global FDI was calculated by summing three Goutallier's fatty degeneration values: supraspinatus, infraspinatus, and subscapularis [8]. Tear sizes were determined using the Snyder classification: a full-thickness rotator cuff tear with only one tendon involved was defined as Snyder type 1, a complete tear of one tendon as Snyder type 2, a full-thickness rotator cuff tear with two involved tendons as Snyder type 3, and a complete tear with two involved tendons as Snyder type 4 [9]. A partial tear was defined as Snyder type 0. Stiffness was defined as forward flexion of <120°, external rotation of < 30° with arm at side, or internal rotation to <L3 at back [10]. As an arthroplasty specific variable, the two groups were compared for the duration of pain. Data from patients planned for surgery for shoulder instability were analyzed separately to determine whether total dislocation rates differed in the two groups. For statistical analysis, patients were classified into four types based on total numbers of dislocations (i.e., one, 2–5, 6–10, or >10).

Statistical Analysis

Statistical analyses were performed using IBM SPSS ver. 22.0 (IBM SPSS Corp., Armonk, NY, USA). The independent T-test was used to compare quantitative variables, and Pearson's chi-square test was used to compare qualitative variables. Linear-by-linear association was used to compare distances from the hospital and travel times for different types of surgery in the two groups. Logistic regression analysis was performed to identify predictive indicators of surgery cancellation. All reported p-values are two-sided, and statistical significance was accepted for $p<0.05$.

Phone Interview Script

The phone interview questionnaire was pre-tested on two patients. Subsequently, questions were simplified and organized in order of increasing difficulty. To increase the validity of the interviews, we decided to exclude patients who answered all questions either yes or no. However, there was no patient who answered all questions either yes or no. Responses to the questionnaire are provided in Table 1. Using standardized questions, all patients were asked the same questions by one interviewer (YNK) over the phone. Interviews took 5 to 8 minutes.

RESULTS

Age was significantly higher in the cancellation group than in the surgery group (p=0.009), and a significantly greater proportion of patients with a history of trauma underwent surgery (p=0.014) (Table 2). Surgery types were significantly different in the cancellation and surgery groups (p=0.017). The mean proportion of arthroscopic rotator cuff repairs was higher in the surgery group, and the proportion of arthroplasties was higher in the cancellation group (Table 3). Mean distance from home to the hospital

Table 1. Reasons provided for cancellation during phone interview

Question	Answer			
1. Current shoulder condition	No treatment	Conservative treatment in other hospitals	Surgery in another hospital	Etc.
2. Because of another medical condition	Yes		No	
3. Due to no time to seek treatment because of my job or social activities.	Yes		No	
4. Due to lack of reliability of medical staff	Yes		No	
5. Due to economic burden	Yes		No	
6. Due to the long waiting period for surgery	Yes		No	
7. Because of persuasion not to undergo surgery of family and acquaintances	Yes		No	
8. Because of fear of surgery	Yes		No	
9. Because of improved symptom	Yes		No	
10. Due to long distance from home to hospital	Yes		No	
11. Choose the main reason for canceling surgery among the 10 reasons above	1–10			

Table 2. Characteristics of study groups

Characteristics	Surgery group (n=224)	Cancellation group (n=96)	p-value
Age (yr)	59.84 ± 0.87	64.07 ± 1.39	0.009*
Sex (male:female)	114:110	45:51	0.510
Direction of surgery (right:left)	158:66	73:23	0.314
Trauma history (yes:no)	72:151	18:78	0.014*
Revision surgery (yes:no)	22:202	16:80	0.083
Contralateral surgical history (yes:no)	22:202	5:91	0.174

Values are presented as mean±standard deviation or number of patients.
*Statistically significant.

Table 3. Types of surgery

Type of surgery	Surgery group (n=224)	Cancellation group (n=96)	p-value
Arthroscopic rotator cuff repair	168 (75.00)	58 (60.42)	0.017*
Arthroplasty	37 (16.52)	29 (30.21)	
Instability	19 (8.48)	9 (9.37)	

Values are presented as number (%).
*Statistically significant.

was significantly greater in the cancellation group (p=0.001), but mean traveling times were similar. Mean waiting period was significantly shorter in the surgery group (p<0.01) (Table 4). Logistic regression analysis was performed on age, trauma history, type of surgery, distance from the hospital, and waiting period, which were found to be significantly associated with cancellation by univariate analysis. Age (p=0.002), type of surgery (p=0.007), distance from hospital (p=0.006), and waiting period (p=0.01) were found to be independent predictors for cancellation.

As a result of subgroup analysis, no significant difference was observed between patients who underwent arthroscopic rotator cuff repair and patients who canceled arthroscopic rotator cuff repair surgery in terms of global FDI, tear size, or stiffness (Table 5). Of 66 arthroplasty candidates, 29 canceled and 37 underwent surgery. Durations of symptoms were not significantly different as determined by the t-test (Table 6).

Linear-by-linear association analysis was used to compare the total number of dislocations between patients that underwent surgery due to shoulder instability and patients who canceled that surgery. There were 19 instability patients in the surgery group and nine in the cancellation group. Six patients in the surgery group and two in the cancellation group were excluded from the analysis due to an indeterminate history. No significant difference was observed between these two groups or with respect to number of dislocations (Table 7). Table 8 shows the results of interviews and the main reasons for cancellation. The most common reason given for cancellation was "another medical condition" (28.1%), and the second most common was "symptom improvement" (20.7%).

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Table 4. Distances from hospital, traveling times, and waiting periods before surgery

Variable	Surgery group (n=224)	Cancellation group (n=96)	p-value
Straight distance from patient house to hospital			0.001*
<10 km	86 (38.4)	18 (18.8)	
10–20 km	39 (17.4)	31 (32.3)	
20–50 km	24 (10.7)	18 (18.8)	
50–100 km	22 (9.8)	5 (5.2)	
≥100 km	53 (23.7)	24 (25.0)	
Time from patient's house to hospital using public transportation			0.790
<30 min	22 (9.8)	11 (11.5)	
30 min–1 hr	85 (37.9)	38 (39.6)	
1–2 hr	50 (22.3)	19 (19.8)	
2–3 hr	26 (11.6)	9 (9.4)	
≥3 hr	41 (18.3)	19 (19.8)	
Waiting period until surgery day (day)	39.92±2.76	94.82±8.18	<0.01*

Values are presented as number (%) or mean±standard deviation.
*Statistically significant.

Table 5. Comparison of variables of arthroscopic rotator cuff repair patients

Variable	Surgery group	Cancellation group	p-value
Global FDI	3.96±0.15	4.12±0.32	0.628
Tear size (partial:T1:T2:T3:T4)*	41:23:29:38:35	11:6:3:14:7	0.942
Stiffness (yes:no)	108:60	35:23	0.591

Values are presented as mean±standard deviation or number of patients.
FDI: fatty degeneration index, T: type.
*Tear sizes were classified using the Snyder classification.

Table 6. Symptom durations among arthroplasty candidates

Variable	Surgery group (n=37)	Cancellation group (n=29)	p-value
Symptom duration (mo)	31.11 ± 6.99	38.28 ± 6.77	0.472

Values are presented as mean±standard deviation.

Table 7. Numbers of dislocations in shoulder instability patients in the two study groups

Total counts of dislocation	Surgery group (n=13)	Cancellation group (n=7)	p-value
1	0	1	0.751
2–5	5	3	
6–10	7	1	
≥10	1	2	

Values are presented as number of patients.

DISCUSSION

The main findings of the present study were that patients in the surgery group were younger, lived nearer the hospital, and had a shorter waiting period. Additionally, a greater proportion of patients in the surgery group were scheduled for arthroscopic cuff repair than patients in the cancellation group. The most common reason for cancellation was another medical condition, and the second most common reason was symptom improvement.

According to a previous study, the majority of cancellations are avoidable [11]; and the risk factors cited as reasons for canceling surgery in previous studies include older age, the need for neurosurgery, the need for local surgery, and planned surgery [7]. In the present study, older age was also found to be a predictive factor for surgery cancellation. Although arthroplasty was performed more often in elderly patients, logistic regression analysis

Table 8. Phone interview results

Question									
1. Treated at other hospitals									
No treatment	Conservative treatment in other hospital					Surgery in another hospital		Etc.	
43 (52.44)	20 (24.39)					18 (21.95)		1 (1.22)	
						Yes		No	
2. Canceled because of another medical condition						29 (35.37)		53 (64.63)	
3. Canceled due to lack of time because of work or social activities						30 (36.59)		52 (63.41)	
4. Canceled due to lack of confidence in medical staff						6 (7.32)		76 (92.68)	
5. Canceled due to cost issue						4 (4.88)		78 (95.12)	
6. Canceled due to a long waiting period						9 (10.98)		73 (89.02)	
7. Canceled due to pressure by family or acquaintances						16 (19.51)		66 (80.49)	
8. Canceled because of fear of surgery						39 (47.56)		43 (52.44)	
9. Canceled because symptoms improved						31 (37.80)		51 (62.20)	
10. Canceled due to distance from hospital						16 (19.51)		66 (80.49)	
11. Choose the main reason for canceling surgery among the 10 reasons above									
Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10
1 (1.2)	23 (28.1)	14 (17.1)	4 (4.9)	1 (1.2)	5 (6.1)	2 (2.4)	9 (11.0)	17 (20.7)	6 (7.3)

Values are presented as number of patients (%). Total n=82.
Q: question.

showed that only age and type of surgery were individually associated with cancellation.

Waiting times for surgery have significant impacts on cancellation and patient outcomes. Previous studies have shown that, for hip and knee replacement surgeries, waiting time is significantly associated with poorer outcomes; and a study conducted in the United Kingdom showed that these poorer outcomes were associated with earning losses of > £11 million (over $14 million) per week [12]. Although no study has investigated the effects of long waiting period on shoulder surgeries, proper management of waiting periods is important for scheduled orthopedic surgeries.

In the present study, global FDI, tear size, and stiffness were not significantly different between patients who underwent rotator cuff repair and patients who canceled rotator cuff repair. In addition, there was no significant difference in preoperative symptom duration between patients who canceled arthroplasty and patients who underwent arthroplasty. Therefore, patient's preoperative symptom duration and radiologic status were not related to surgery cancellation.

The main reason given for cancellation by our patients was another medical condition confirmed by doctors, which suggests preoperative medical clearance should be considered early during the decision-making process. However, previous studies on the effect of medical clearance placed emphasis on perioperative complication risk or transfusion rate [13-15], but medical clearance also has a significant impact on cancellation rates. Tan et al. [16] showed that preoperative medical clearance significantly reduces cancellation risk, and medical clearance provides a means of assessing the risk of surgical cancellation [17].

The second most common reason given was improved symptoms. Previous studies have reported that cuff tear size and pain are not related [18,19], and other studies have concluded that cuff re-tear rate is not correlated with pain [20,21]. However, cuff tears and arthritic changes in shoulder joints have irreversibly progressive impacts, which suggest the advisability of canceling surgeries based on considerations of pain. Furthermore, healing rate is correlated with shoulder motion strength after cuff repair [22]. These observations suggest that before surgical decisions are made, the findings of functional evaluations, including shoulder motion strength, should be considered with radiologic data and patient-report pain. This affords the opportunity to explain to patients in more detail the importance of undergoing surgery. Although ranked fourth among the reasons for cancellation, 48% of patients that canceled cited fear of surgery. The Amsterdam Preoperative Anxiety and Information Scale is a tool that quantitively assesses preoperative fear or anxiety [23]. This scale was introduced in 1996 and can be used to measure preoperative fear; its effectiveness has been confirmed by many studies [24,25].

In one study the most common reason for cancellation was inconvenience caused by a change in schedule [6]. Also, approximately 19% of surgeries were canceled because patients were unable to change the timing of surgery. Though scheduling systems vary, staff at our institution confirm schedules telephonically two weeks before surgery. Although this process is demanding of hu-

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man resources, the process probably reduces cancellations. This reduces schedule gaps and waste of hospital resources.

The study has several limitations. First, statistical analysis could not be performed on the results of phone interviews. Because telephone interviews are qualitative studies, unlike quantitative studies, statistical significance compared to control groups cannot be verified. However, in order to compensate for these shortcomings, we designed the study so that patients who canceled surgery could be asked to choose the main reason for canceling surgery and to order the main reasons for cancellation. Second, the use of telephone interviews and an interviewer from our institution may have introduced bias. Third, patient information was initially obtained through brief interviews conducted in the outpatient clinic. For the surgery group, re-confirmation was received during hospitalization; but for the cancellation group, re-confirmation was not performed. This created the possibility that the cancellation group information may be inaccurate. Fourth, history for the surgery group was collected through a retrospective review using the electronic medical records. Therefore, information such as the timing of previous surgeries could not be assessed due to lack of information. Moreover, ascertaining travel time from the cancellation group patients was practically impossible because the patients did not remember the distance. Therefore, the travel time was measured using the map application.

Older age, the need for arthroscopic rotator cuff repair surgery, longer distance from patient home to the hospital, and longer waiting period significantly increased the chance of cancellation. The main reason for canceling surgery was another concurrent medical condition. Therefore, when surgeons recommend shoulder surgery to patients, identification of concurrent diseases in advance is necessary. Surgeons should also consider the possibility of surgery cancellation by identifying patient's age, type of surgery, distance from the hospital, and waiting time.

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