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Factors Influencing Peri-Operative Patient Satisfaction in Arthroscopic Procedures of Shoulder Joint in Beach Chair Position under Isolated Regional Anaesthesia

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Abstract

This study was aimed to identify the ideal candidates undergoing arthroscopic procedures of the shoulder joint in beach chair position, who would be compliant and satisfied with isolated regional anaesthesia in the preoperative level. In this prospective study, 216 patients underwent primary shoulder arthroscopy under regional anaesthesia. There was a statistical association between the intraoperative sedation levels and anxiety, smoking and alcohol habits of the patients. We concluded that patients with anxiety scores>15, alcohol dependence, smoking habits should be taken up with caution as they tend to have poor satisfaction outcome in terms of comfort during the procedure, intra operative pain, higher requirement of sedation and higher requirement of post-operative analgesia which all lead to poor perioperative experience for the patient.

Keywords: Beach chair position; Pain predictors; Patient compliance; Regional anaesthesia; Shoulder arthroscopy

Introduction

Shoulder arthroscopy has gained immense popularity in the last two decades with many surgeons realizing the benefits of a quick, effective and pain free way to treat shoulder problems like Rotator Cuff tears, Impingement, and Instability [1-3]. Regional anaesthesia has revolutionized the outlook to shoulder arthroscopy, making it a good choice for both the patient and the surgeon, performed in beach chair position. Though several studies compare the merits and demerits of both the types of anaesthesia, we are still unclear about the patterns of outcome in patient safety, comfort and satisfaction while using regional anaesthesia [4-6]. It has always been assumed that the patient's comfort and satisfaction depend on the postoperative pain levels. Although arthroscopic shoulder -surgery has been credited with less pain and more patient comfort when compared to open surgery [7-9] there are very few studies which unveil the factors which might influence the post-operative pain and patient comfort [10,11]. Through this study, we intended to identify in patients undergoing regional anaesthesia, the "red flags" as we liked to call them, which determine a poor patient compliance during the surgery and poor tolerance to pain post operatively eventually leading to a poor patient satisfaction.

This study was aimed to identify the ideal candidates who would be compliant and satisfied with regional anaesthesia in the preoperative level.

Materials and Methods

Study design

Prospective observational study including all patients undergoing shoulder arthroscopy under regional anaesthesia in Beach chair position in our institute for a period of six months.

Population Studied

During the study period, 216 patients underwent primary shoulder arthroscopy under regional anaesthesia. Four patients were converted to general anaesthesia on table due to block failure. A total of 212 patients were henceforth under the study.

Anaesthesia Used

Based on the number and position of the portals, the patients were given an ultrasound guided isolated interscalene block with 0.5% Ropivacaine or combined with a suprascapular nerve block. The block acted as a source of anaesthesia as well as postoperative analgesia. Cutaneous anaesthesia over the posterior portal site was also administered to reduce incisional wound pain.

The shoulder arthroscopy procedures were grouped into three based on the duration of the procedure

Group A < 30 minutes

Group B 30 minutes to 60 minutes

Group C > 60 minutes

At the preoperative level, patients were evaluated for the variables- anxiety, alcohol consumption, smoking habits, previous shoulder surgeries, comorbidities of the patient. The anxiety levels were measured by the State Trait Anxiety Inventory [12], a quick, effective, and self-administered test which is highly validated in psychologic and pain literature [13,14]. It is a psychological inventory based on a four-point Likert scale and measures two types of anxiety-state anxiety, or anxiety about an event, and trait anxiety, or anxiety level as a personal characteristic. Alcohol consumption history was noted, and patients were classified into low, moderate and binge drinkers as per the National Institute on Alcohol Abuse and Alcoholism. Moderate drinking was defined up to 1 drink per day for women and up to 2 drinks per day for men. Patients with drinking habits lesser than these levels were considered as social drinkers. Patients with drinking habits equivalent to or more than these levels were included in substance use group.

Patients who smoked were categorized into "current smokers" as per the guidelines of Centers for Disease Control and Prevention, which is defined as an adult who has smoked 100 cigarettes in his or her lifetime and who currently smokes cigarettes. They were included in the substance use group. Intraoperatively, patients were monitored for physiological measures of pain like pulse rate, respiratory rate and for regional anaesthesia complications consisting of vasovagal episode, Horner's syndrome, hemi diaphragmatic palsy, systemic toxicity, and block failure. Some patients had to be sedated based on their intraoperative pain and comfort. The sedation used was classified by the Ramsay Sedation Scale [15]. Patient's pain was assessed by the Visual Analog Score for pain at hours 0,2,4,6,8,10 after the surgery. The pain VAS is a continuous scale comprised of a horizontal line, anchored by 2 verbal descriptors, one for each symptom extreme with "no pain" (score of 0) as the response to one extreme and "pain as bad as it could be" or "worst imaginable pain" (score of 10) as the response to the other extreme. Patients were interviewed post operatively, regarding their comfort level during the surgery with simple questions with a yes or no response. Based on their remarks they were classified into two groups "comfortable" and "not comfortable" during the surgery.

The shoulder arthroscopy procedures were performed in beach chair position by a single operating surgeon. The patients were conscious during the surgery and were interacting with the surgeon as they viewed the procedure in the monitor. The number of portals in each procedure was recorded and used to interpret the complexity of the procedure done [16].

Statistical Methods

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

The following assumption on data is made

- Dependent variables should be normally distributed
- Samples drawn from the population should be random. Cases of the samples should be independent.

Analysis of Variance (ANOVA) has been used to find the significance of study parameters between three or more groups of patients. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis. Fisher Exact test is used when cell samples are very small. Paired Proportion test has been used to find the significance of proportion in paired data. Smaller percentage of Improvement becomes significant at lower tail compared to higher tail.

Results

Anxiety

It was found that there was an association between the intraoperative sedation levels as measured by Ramsay Sedation Scale and Anxiety of the patients. Statistically people who had higher anxiety scores were found to require more sedation intraoperatively (Table 1a). The level of sedation was decided by the anaesthetist who was blind to the anxiety scores measured, based on the intraoperative heart rate, blood pressure and patient's discomfort. Patients with high anxiety scores were also more likely to feel uncomfortable during the surgery even in those whose VAS scores were less. VAS before and after 6 hours is non-normal in distribution. Spearman's correlation coefficient was used to study the association between them. Spearman's correlation coefficient between VAS before 6 hours and anxiety ($\rho = 0.469$) and VAS after 6 hours and anxiety ($\rho = 0.434$) suggests that there is an association between VAS and anxiety (Table 1b). Patients with higher anxiety scores also had a higher VAS score post-operatively irrespective of their sedation levels during the surgery and their comfort perception during the surgery.

	RSS	N	Mean Rank
ANXIETY	A	131	75.61
	B	45	136.32
	C	36	181.61
	Total	212	

Table 1a: Ramsay Sedation Scale (RSS) Vs Anxiety.

			ANXIETY	Before6H	After6H
Spearman's rho	ANXIETY	Correlation Coefficient	1	.469**	.434**
		Sig. (2-tailed)	.	.000	.000
		N	212	212	212

Table 1b: Correlations between VAS scores before 6 hours(6H) and after 6 hours against Anxiety scores.

Substance Use

Patients who fell above the category of moderate drinking, as described by the National Institute on Alcohol Abuse and Alcoholism and current smokers, as defined by Centre for Disease Control and Prevention were sought. None of our patients were non-medical drug abusers (Table 2a). A statistically significant correlation existed between substance use and Ramsay Sedation Scales (Table 2b) Subjects with substance use were more likely to feel "uncomfortable" during the surgery irrespective of their post op VAS scores. Table 2c gives the two-way table for substance abuse against patient's comfort. Table 2d gives the statistical correlation.The VAS scores calculated post operatively also had a statistical co relation with substance use. These subjects were more likely to have higher VAS scores post operatively (Table 2e).

		SUBSTANCE USE		Total
		No	Yes	
Ramsay	A	117	14	131
Sedation	B	28	17	45
Scale	C	26	10	36
Total		**171**	**41**	**212**

Table 2a: The number of subjects under each category of Ramsay Sedation Score cross tabulated to use of substances (alcohol and smoking).

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	17.737[a]	2	.000
Likelihood Ratio	16.964	2	.000
Linear-by-Linear Association	10.592	1	.001
N of Valid Cases	212		

Table 2b: Correlation between substance use and Ramsay Sedation Scales.

		SUBSTANCE USE		Total
		No	Yes	
PATIENT	COMFORT Not comfortable	19	13	32
DURING SURGERY	Comfortable	152	28	180
Total		171	41	212

Table 2c: The number of subjects under each category of patient's comfort cross-tabulated to use of substances (alcohol and smoking).

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	10.946[a]	1	0.001		
Continuity Correction[b]	9.398	1	0.002		

Likelihood Ratio	9.4	1	0.002		
Fisher's Exact Test		1	0.001	0.003	0.002
Linear-by-Linear Association	10.895				
N of Valid Cases	212				

- 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.19.
- Computed only for a 2x2 table

Table 2d: Statistical correlation between patient's comfort and use of substances.

Test Statistics[a]

	Before6H	After6H
Mann-Whitney U	2597	2699.5
Wilcoxon W	17303	17405.5
Z	-3.282	-2.495
Asymp. Sig. (2-tailed)	0.001	0.013

a. Grouping Variable: SUBSTANCE1

Table 2e: Statistical correlation between VAS score and use of substance.

Gender

Of the 212 patients who underwent the procedure, 141 were men and 71 were women. Using Mann Whitney Test, there was a significant difference in average anxiety between Male and Female. Females tend to have more anxiety scores than males (Table 3a). It was also observed that VAS is significantly different for males and females, before and after 6 hours after surgery, using Mann Whitney test. Females had higher VAS scores than men both before 6 hours and after 6 hours (Table 3b). There was no statistical significance between men and women with regards to patient comfort during the procedure. Using Chi-square test it was derived that there was no association between gender and patient comfort (Table 3c). Similarly, there was no difference in the intraoperative sedation required which was measured by Ramsay Sedation Scale between the men and women (Table 3d).

Test Statistics[a]

	ANXIETY
Mann-Whitney U	3913.5
vbvWilcoxon W	13924.5
Z	-2.628
Asymp. Sig. (2-tailed)	0.009

a. Grouping Variable: SEX

Table 3a: Statistical correlation between gender and anxiety scores.

Test Statistics[a]

	Before6H	After6H
Mann-Whitney U	4221.500	3942.500
Wilcoxon W	14232.500	13953.500
Z	-2.370.018	-2.754
Asymp. Sig. (2-tailed)		0.006

a. Grouping Variable: SEX

Table 3b: Statistical correlation between VAS score and gender.

Chi-Square Tests

	Value	df	Asymptotic Significance (2sided)	Exact Sig. (2sided)	Exact Sig. (1sided)
Pearson Chi-Square	.861[a]	1	0.353		
Continuity Correction[b]	0.525	1	0.469		
Likelihood Ratio	0.84	1	0.359		
Fisher's Exact Test		1		0.417	0.232
Linear-by-Linear Association	0.857		0.355		
N of Valid Cases	212				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.72.

Table 3c: Statistical correlation between gender and patient comfort.

SEX * RSS Crosstabulation

Count

		RSS			Total
		A	B	C	
SEX	F	36	20	15	71
	M	95	25	21	141
Total		131	45	36	212

Table 3d: Bivariate table showing the frequency of Male and Female under different levels of sedation.

Complexity of the surgery

The number of portals were studied as a measure of the complexity of the surgery and was searched to establish a co relation with the other variables under study.It was established that more complex the surgery is, higher was the sedation required intraoperatively. Using Fisher's Exact test, it was concluded that there is a significant association between Ramsay Sedative Scale and the number of portals. It was also revealed that the VAS scores both before and after six hours had a statistical correlation with the number of portals. It can be seen from Kruskal Wallis test that there is significant difference in VAS for the number of portals before and after 6 hours (Table 4).

However, there was no co-relation between the number of portals and patient comfort indicating that severity of the surgery did not determine the patient's comfort during the surgery.

Test Statistics[a,b]

	Before6H	After6H
Chi-Square	9	12.173
Df	3	3
Asymp. Sig.	0.029	0.007

a. Kruskal Wallis Test

b. Grouping Variable: PORTALS

Table 4: Statistical correlation between Vas scores and number of portals.

Cut-off value for anxiety for giving sedation

By examining the anxiety score for sedation levels, A and B using ROC curve it can be observed that sum of sensitivity and specificity is maximum for anxiety level greater than or equal to 9. Hence, we can consider that up to anxiety score 9 sedation level A (no sedation) is appropriate and for anxiety score greater than or equal to 9 sedation level B can be used (Table 5a, Figure 1).

Coordinates of the Curve

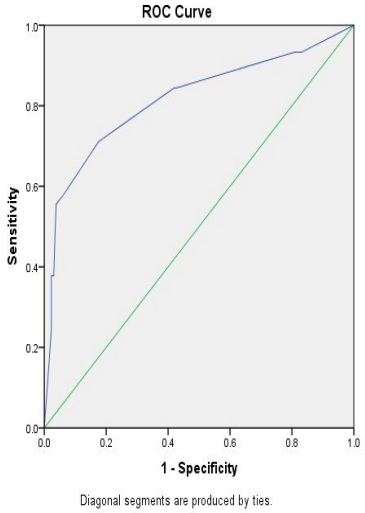
Test Result

Variable(s): ANXIETY

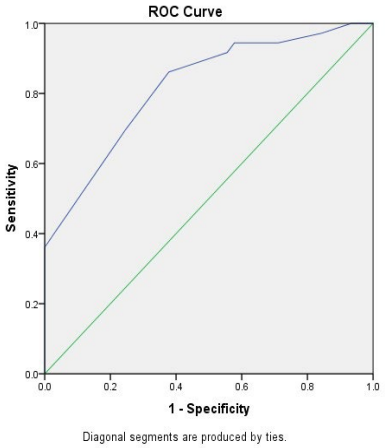
Positive if Greater Than or Equal To[a]	Sensitivity	1 - Specificity	spec	sen+spec
3	1	1	0	1
4.5	0.933	0.832	0.168	1.101
5.5	0.933	0.809	0.191	1.124
6.5	0.844	0.427	0.573	1.417
7.5	0.844	0.42	0.58	1.425
9	0.711	0.176	0.824	1.536
11	0.578	0.061	0.939	1.517
13	0.556	0.038	0.962	1.517
14.5	0.378	0.031	0.969	1.347
15.5	0.378	0.023	0.977	1.355
17	0.244	0.023	0.977	1.222
19	0	0	1	1

The test result variable(s): ANXIETY has at least one tie between the positive actual state group and the negative actual state group.

Table 5a: Co-ordinates of the curve for A and B.



Similar analysis when done between sedation B and C using ROC curve, it can be seen that the sum of sensitivity and specificity is maximum for anxiety score 15. This leads to the conclusion that up to anxiety score 15 sedation level B can be used and for anxiety score greater than or equal to 15 sedation level C can be used (Table 5b, Figure 2).



Coordinates of the Curve

Test Result Variable(s):

Positive if Greater Than or Equal To[a]	Sensitivity	1 -Specificity	spe	sen+spe
3.00	1.000	1.000	0.000	1.000
5.00	1.000	.933	0.067	1.067
7.00	.972	.844	0.156	1.128
9.00	.944	.711	0.289	1.233
11.00	.944	.578	0.422	1.367
13.00	.917	.556	0.444	1.361
15.00	.861	.378	0.622	1.483
17.00	.694	.244	0.756	1.450
19.00	.361	0.000	1.000	1.361
21.00	.056	0.000	1.000	1.056
23.00	.028	0.000	1.000	1.028
25.00	0.000	0.000	1.000	1.000

Table 5b: Co-ordinates of the curve B and C.

Discussion

During shoulder arthroscopy under regional anaesthesia in beach chair position, a pattern of discomfort experienced by the patient during surgery and subsequent elevated levels of immediate postoperative pain was observed in certain groups of patients when compared to others, who underwent the same procedures under similar circumstances. The concern raised was attributed to the increase in postoperative analgesia, conversion to general anaesthesia on table, sedation given intraoperatively, overall leading to poor patient satisfaction. The purpose of this study was to investigate how a patient's comfort during and after shoulder arthroscopy is composed and to establish a list with all pre-operative determinants of intraoperative patient comfort and immediate postoperative pain, an orthopaedic

surgeon should consider, so he/she identifies patients with a poor compliance to surgery under regional anaesthesia in the outpatient department itself [16,17].We also believed that patients who are likely to require prolonged pain management can be identified preoperatively. When such "risk factors" are identified, we can institute pain management treatment aggressively, and educate the patient appropriately thus constructing a triumphant strategy to improve patient satisfaction.

Regional Anaesthesia in shoulder arthroscopy procedures have various benefits like intraoperative analgesia, muscle relaxation, fewer side effects, early recovery and shorter hospital stay. Numerous studies have established these benefits in various orthopaedic procedures [4-6,18,19]. What intrigued us was the other benefits of regional anaesthesia which allowed a surgeon to have an interactive session with his patients during the surgery, elucidating their condition, while the patients watched it over the monitor. An additional procedure, if required based on intraoperative findings, could also be elaborated, reasoned out to the patient, and performed. Such advantages were lost when a patient required higher sedation intraoperatively. It can be inferred from the results that anxiety, substance use and the severity of the surgery independently lead to increased need of sedation intraoperatively thus hampering the overall comfort of the patient. Among the patients who were interviewed postoperatively about their comfort during the surgery, those with higher anxiety scores and substance use tend to feel "uncomfortable" irrespective of their sedation levels during the surgery. However, the complexity or duration of the procedure did not influence the comfort perception of these patients, making it clear that long duration surgeries, while done in regional anaesthesia, did not make the patient uncomfortable. Though females had more anxiety scores than the men in this study, we could not find a statistical association of gender with patient's perception of comfort.

Another merit of regional anaesthesia is post-operative analgesia. The current study outlines the immediate postoperative pain pattern in shoulder arthroscopy. The VAS scores showed a clear increase six hours after the surgery. The mean VAS was 0.9 before six hours and increased to 2.18 after six hours. Thus, it was established that pain even after a rotator cuff repair (GROUP C), which was found to have the highest VAS score, was much less in contrary to a total hip replacement (mean VAS ranged from 5.4 to 5.6) or a total knee replacement (VAS 5.4) [20,21]. The results help us infer that the postoperative pain increased with preoperative anxiety, substance use and with the severity of the surgery. Females exhibited increased VAS scores when compared to men and it could partly be attributed to their increase in anxiety scores. From our results, we can conclude a cut-off value of the anxiety scores which would suggest the sedation required for the patient. At the onset, a quick history about the patient's substance use and the state-trait anxiety inventory helped a surgeon identify the patients at risk and supervise the patient education and improve their self-efficacy. Such simple screening tools if routinely used in shoulder arthroscopy, can aid a surgeon to triage his patients at risk and tailor make the preoperative and postoperative management protocol.

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