

# Right shoulder-tip pain following laparoscopic cholecystectomy

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## Keywords:

Right shoulder pain,  
laparoscopic cholecystectomy,  
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## ABSTRACT

Right shoulder-tip pain repeatedly mentioned in most literature as a subsequent sequel of laparoscopic cholecystectomy. The aim of study is to evaluate the Incidence of Right Shoulder Tip Pain after Laparoscopic Cholecystectomy. A prospective study. All patients exposed to laparoscopic cholecystectomy where checked postoperatively for the presence or absence of right shoulder-tip pain during the 1st ten days. sociodemographic variables like age, gender, BMI of patients in addition to measuring the clinical variables related to studied cases like duration of surgery, occurrence of spillage of bile, washing by normal saline, time of start postoperative pain, time of end postoperative pain. One hundred patients enrolled in this prospective study. There were 71 patients (71%) complaining of postoperative right shoulder-tip pain (group A) started at the first 48 hours after operation, and 29 patients (21%) did not complain of postoperative shoulder pain (group B). Results showed no significant difference in terms of age, gender, BMI, and spillage of bile &/or stones in either group. Incidence of right shoulder tip pain postoperatively was significantly lower when we used intraperitoneal normal saline irrigation. Right shoulder tip pain can be kept to minimum if the duration of surgery is reduced. Right shoulder-tip pain, which may occur post-laparoscopic cholecystectomy, is variable in duration, severity and character.



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## 1. INTRODUCTION

Laparoscopic cholecystectomy has rapidly become the procedure of choice for routine gallbladder removal and is currently the most commonly performed major abdominal procedure [1]. First laparoscopic cholecystectomy was performed in 1987 by Phillip Mauret and later established by [2], [3]. Whereas it is true that no operation has been more profoundly affected by the advent of laparoscopy than cholecystectomy has, it is equally true that no procedure has been more instrumental in ushering in the laparoscopic age than laparoscopic cholecystectomy has. In the present surgical era, laparoscopic cholecystectomy has become more popular owing mainly to the benefits of its minimal access techniques which leave minimal surgical scars, less post-operative pain, shorter hospital stay, early recovery and lower mortality rate [4], [5]. In spite of advances in techniques of laparoscopic cholecystectomy, post-laparoscopic cholecystectomy pain is still a major concern, and most of patients require postoperative analgesics [6]. However, visceral pain, port-site

pain, and referred shoulder pain are reported in laparoscopic cholecystectomy patients [7]. The definition of referred pain in this study was diffuse pain remote from the site of surgery that is poorly localized by the patients. Post-laparoscopic cholecystectomy pain is multifactorial, and is characterized by abdominal and particularly shoulder tip pain; due to surgical trauma to the abdominal wall at the port sites, chemical irritation by carbon dioxide, bile and/or stone spillage due to inadvertent perforation of gallbladder, rupture of blood vessels caused by rapid distension of the peritoneum (peritoneal stretching), traumatic traction on the nerves, and distention of the abdominal wall and the diaphragm [8]. The incidence of shoulder tip pain was almost unheard of in open cholecystectomy era and first reported after laparoscopic gynecological procedures [9]. The incidence of shoulder-tip pain following laparoscopic cholecystectomy varies from 35-50% [10], [11]. Severity of pain ranges from mild to severe [12].

As for shoulder, pain in laparoscopic cholecystectomy the precise reason is unclear, but the leading hypothesis is that carbon dioxide introduced in abdomen causes diaphragmatic irritation causing referred pain to C4 segment [13]. Others believe that rapid distension of the peritoneum may be associated with overstretching of the diaphragmatic muscle fibers [14], tearing of blood vessels, traumatic traction of nerves, and release of inflammatory mediators [15]. The prolonged presence of shoulder tip pain suggests excitation of phrenic nerve [16]. The aim of study is to evaluate the Incidence of Right Shoulder Tip Pain after Laparoscopic Cholecystectomy.

## **2. Method**

This prospective study done at al-kindy teaching hospital and rizgary teaching hospital/department of surgery between Jan. 2017 and Feb. 2018. We collected data preoperatively, before discharge (day of surgery), and after discharge (on days one, two, three, four, and ten). To collect preoperative and pre-discharge data, we interviewed patients at the hospital where they underwent surgery. To collect post discharge information, we conducted telephone interviews with the patients. The inclusion criteria's for cases were uncomplicated symptomatic gall stones disease of both genders, who were fit for general anesthesia.

### **2.1 Exclusion criteria**

1. History of acute cholecystitis, pancreatitis, gangrene or empyema of the gallbladder, choledicolithiasis and cholangitis.
2. Prior history of shoulder pain.
3. Patients with multiple laparotomies.

All patients were operated (an elective laparoscopic cholecystectomy) in operating room under general anesthesia with endotracheal intubation in the reverse Trendelenburg with right side up position by using standard four ports laparoscopic cholecystectomy. The pneumoperitoneum created by insufflating carbon dioxide gas through a closed Veress needle technique due to its high solubility and the noncombustible properties, Pneumoperitoneum pressure ranged from 10 to 12 mmHg for all patients.

Operative time recorded starting from the time of making the incision of the first port to the time of closure of skin. We used wash during and at the end of operation for those patients who had bile &/or stone spillage, minimal annoying bleeding, and to remove bile and clotted material. Irrigation done by normal saline infused in the surgical bed and in subphrenic space. The saline suctioned immediately. Closed tube drain inserted through the lateral most port and placed in the subhepatic space for all patients. All patients were checked for the presence or absence of right shoulder tip pain during the 1st 10 postoperative days. Patients grouped into two groups (A & B) according to the presence or absence of right shoulder tip pain postoperatively, where: Group A represented patients who developed post-laparoscopic cholecystectomy right shoulder pain. Group

B represented patients who did not developed right shoulder pain post laparoscopic cholecystectomy. All Patients received analgesia post-operation, on the day of surgery:

- Paracetamol 1000 mg intravenously administered in 3 doses with
- Tramadol 100mg intravenously administered in 2 doses.

Post-operative right shoulder tip pain severity was assessed by using The Numeric Rating Scale (NRS) table-1. [17].

## 2.2 Statistical analysis

Done by SPSS 22, frequency and percentage used for categorical data, mean and SD for continuous data. Chi-square used for assessed association between variables. P-value less or equal to 0.05 is consider significant.

## 3. Results

One hundred patients were enrolled in this prospective study. The male to female ratio was around. Their ages ranged from 19 to 66 years. The mean age of patients was  $37.08 \pm 11.44$  year, with no statistically significant difference between mean age of male and female patients,  $PV=0.804$ , (table-2) and (figures 1, 2). The mean BMI of all patients was  $28.85 \pm 3.07$  with no significant difference between male and female,  $PV=0.118$ , look table 2 and figure 3. All patients, post-operative right shoulder-tip pain was identified in 71 of patients (71%) (Group A). No post-operative right shoulder-tip pain was in the other 29 patients (29 %) (Group B.) Figure-4). Both groups matched for sex, age, BMI, spillage of bile and/or stone, wash by normal saline, and duration of surgery (table-3). **Duration of surgery:** Length of surgical procedures ranged from 15 to 90 minutes. No significant difference was observed between groups in terms of demographic characteristics, spillage of bile and/or stone, ( $p > 0.05$ ) (table-3). However, a significant positive correlation was found between the use of wash by normal saline ( $P$  value = 0.002) and duration of surgery ( $P$  value = 0.024) between two groups. (table-3). Group A patients had normal saline wash in 23 patients while 48 patients of them did not need wash, so pain occurrence was higher when wash was not used. In addition to that group B patients include 19 patients who needed wash in contrast to 10 patients who did not need wash (figure- 5). Accordingly wash played very important factor in reducing the incidence of shoulder-tip pain. Group A patients had 22 patients developed right shoulder pain postoperatively (duration of surgery less than 30 min) while 49 patients (duration of surgery more than 30 min) developed right shoulder pain postoperatively, so pain occurrence was higher when duration of surgery was more than 30 min.

In addition to that group B patients had 16 patients did not develop right shoulder pain postoperatively (duration of surgery less than 30 min). in contrast to 13 patients didn't develop right shoulder pain postoperatively (duration of surgery more than 30 min). (figure- 6). Accordingly duration of surgery played very important factor in reducing the incidence of shoulder-tip pain.  $P$  Value was 0.024. So the incidence of shoulder-tip pain was lower the shorter the duration of surgery. (figure- 6). The patients (group A) in this study experienced right shoulder-tip pain on days zero and one. (Table-4, Fig-7). On recording the start of shoulder tip pain we noticed that pain on the day of surgery occurred in 46 patients (64.8%), while on Day 1 occurred in 25 patients (35.2%) only. (Table-4, Fig-7). Post-operative shoulder tip pain severity was assessed by using The Numeric Pain Rating Scale (NPRS): Pain severity ranged from mild to moderate. (Table-5). On recording, the start of shoulder tip pain According to use of wash by N.S., results was as shown in (table-6). Right shoulder tip pain ratings declined gradually, on day ten, no patients still had pain. On recording the time of disappearance of pain, the earliest disappearance of pain was on postoperative Day 2, and the last disappearance was on Day 10 the rest of patients had disappearance of pain in the days between day 2 and 10 as shown in (table-7, fig-8).

#### 4. Discussion

The period of recovery after laparoscopic cholecystectomy, depend on multiple factors of which right shoulder tip pain is significant [19]. Right shoulder tip pain repeatedly occurs post laparoscopic cholecystectomy making convalescence period less comfortable, delay patient discharge and be an excuse for the use of analgesics [19]. The etiology and mechanism of this type of pain are still not clearly understood. Various investigators tried to discover the cause of this shoulder pain and found that it's multifactorial including the overstretching of the diaphragmatic muscle fibers, tearing of blood vessels, traumatic traction of nerves by rapid distension of the peritoneum [20] or the effects of irritation due to bile and/or stone spillage which may occurs inadvertently in addition to the effects of normal saline which is commonly used for intraperitoneal wash to reduce the incidence of shoulder pain. Interestingly, the results of our study showed that overall frequency of right shoulder tip pain is much higher than that reported by other studies. Our study shows that the incidence of post-laparoscopic cholecystectomy right shoulder-tip pain was 71% of all patients. This result was much more than other results of other studies e.g.: A study by [26] published in 2016 has mentioned a frequency of 15% of shoulder-tip pain post-laparoscopic cholecystectomy surgery [27]. Another study done by who showed an incidence of right shoulder-tip pain following laparoscopic cholecystectomy to be 35% and 50% respectively [10], [11]. Likewise, another study by [24] published in October 2010 has mentioned a frequency of 62% of right shoulder pain post- laparoscopic cholecystectomy surgery [25]. This difference may be due to the following reasons:

1. The threshold of pain or pain threshold of our patients is less than others are. However, there is marked interindividual variability of post-operative shoulder-tip pain following laparoscopic surgery.
2. Not all our patients received any premedication before surgery. Inadequate treatment of pain related to surgery may be associated with complications and prolonged recovery time and increased morbidity and mortality rates.
3. Operative (laparoscopy) technique causes:- Gas delivery systems, CO<sub>2</sub> purity; The insufflation gas needs to be filtered to reduce contamination, heated to reduce hypothermia and hydrated to preserve cellular integrity and reduce adhesion formation [21].
4. Surgical techniques “complications of technique.”

The patients in our study experienced the pain on days zero and one. Like patients in a previous study by who experienced the pain within the first 48 hours after surgery [27]. Our patients ‘ratings of pain did not begin to decline until day two. Our study results showed that the wash with N.S. effect on the incidence of right shoulder-tip pain post-laparoscopic cholecystectomy, (*p value* =0.002) table-3, where the incidence of shoulder pain was decreased in patient in whom we use wash by normal saline and this result is compatible with other studies results where: [21] concludes that intraperitoneal saline wash after laparoscopic cholecystectomy is significantly effective in reducing shoulder tip pain in early post-operative period [22]. Ji Won Chung et al says that irrigation with normal saline has reduced the incidence of postoperative shoulder-tip pain [23]. Results was also compatible with our results which showed Postoperative shoulder tip pain reduced significantly when N.S. irrigation was used, (*p value* < 0.001) [10]. [23] says that The saline washout procedure should be recommended during laparoscopic cholecystectomy because it is a simple way to reduce shoulder pain incidence and obviously this coincide with our results [24]. Concluded that intraperitoneal normal saline infusion could effectively reduce shoulder pain after laparoscopic surgery [28]. However, this was not compatible with study that shows that the addition of intraperitoneal normal saline infusion to low-pressure carbon dioxide pneumoperitoneum seems to reduce the intensity but not the frequency of shoulder-tip pain after laparoscopic cholecystectomy [27]. Our study also showed that the duration of surgery has a significant effect on lowering the incidence of postoperative right shoulder-tip pain (*P value* 0.024) table-3. Where shoulder pain was lower in patients whose the duration of surgery was less than 30 min, than the patients who is the duration of surgery was more than 30 min. This compatible with [24], [27] opinions that

say shoulder-tip pain can kept to a minimum if the operative times are reduced [25]. But this was not compatible with study which shows that the duration of surgery has no significant impact on the incidence of postoperative shoulder pain (P value >0.05 in all subgroups) [26].

## 5. Conclusion

Right shoulder-tip pain, which may occur post-laparoscopic cholecystectomy, is variable in duration, severity and character. The etiology of right shoulder-tip pain following laparoscopic cholecystectomy is multifactorial. Intraperitoneal irrigation by normal saline offered a detectable benefit to patients undergoing laparoscopic cholecystectomy.

## 6. References

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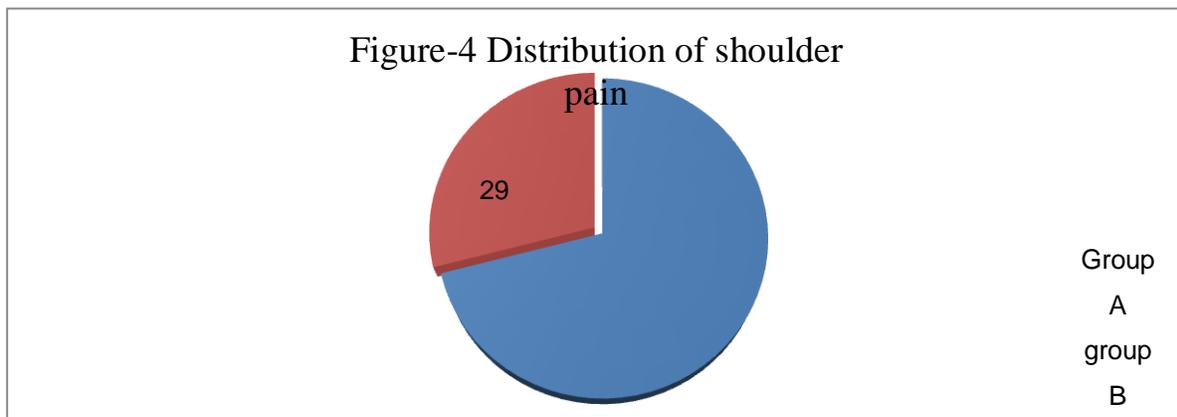
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**Table 1:** Distribution of studied patients according to age and gender

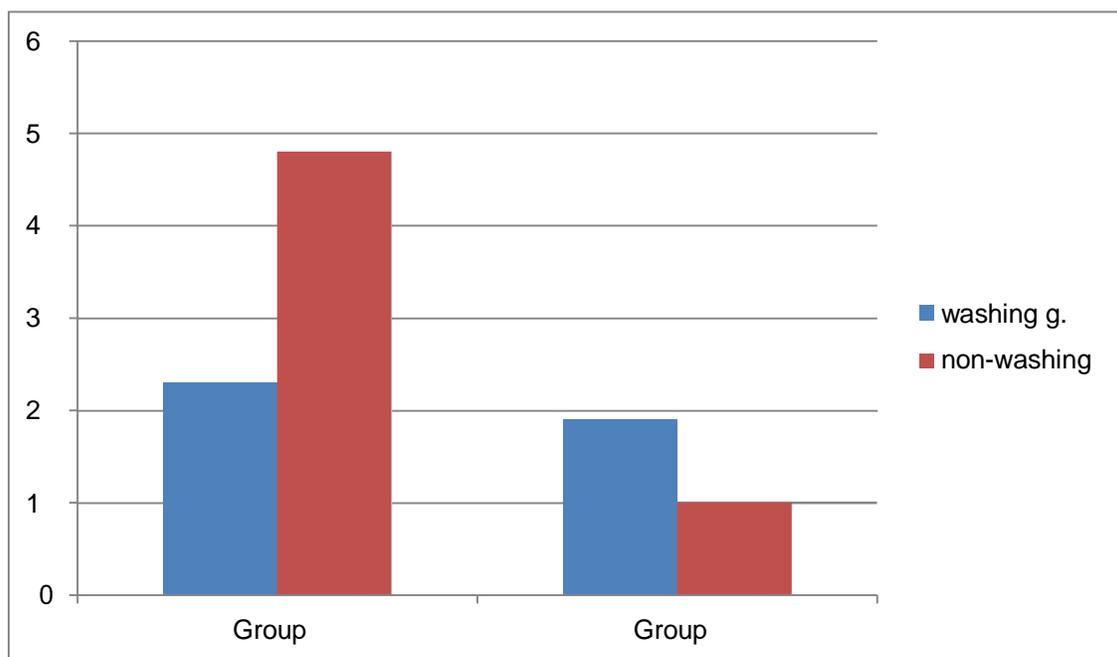
	Sex	N	Mean	Std. Deviation	PV
Age	Male	28	37.46	8.203	0.804
	Female	72	36.93	12.531	
Mean age			37.08	11.44	
BMI	Male	28	28.08	3.688	0.118
	Female	72	29.15	2.776	
Mean BM			28.85	3.07	



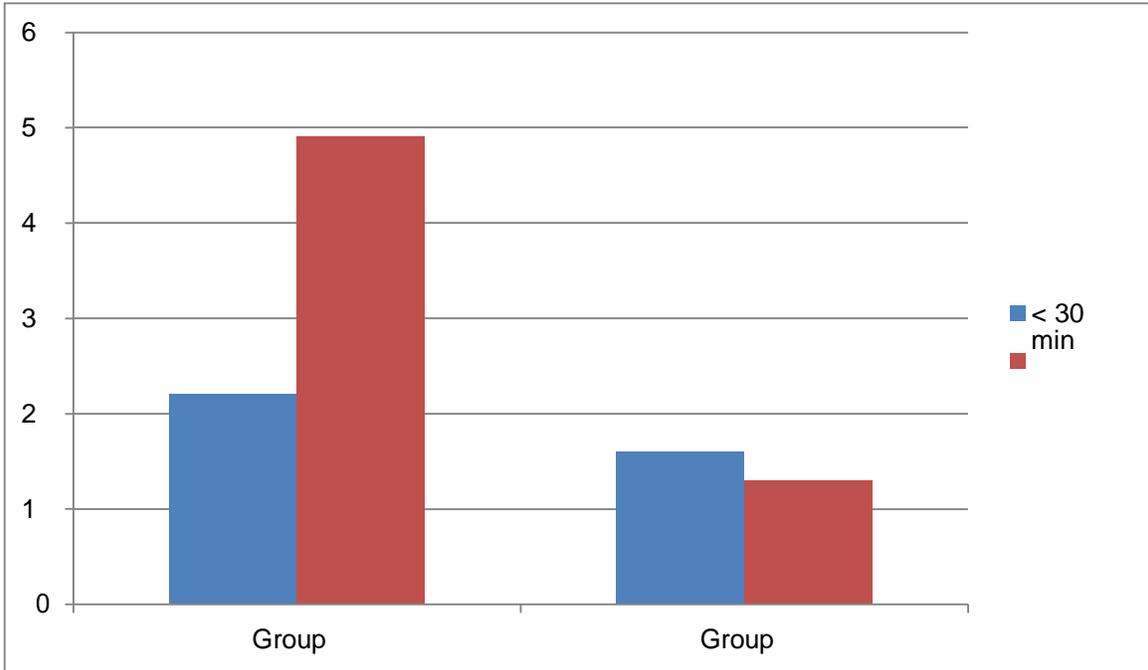
**Table-3** Comparison between the two groups according to variables.

		Group				P value
		A		B		
		Count	Row N %	Count	Row N %	
Gender	Male	19	67.9%	9	32.1%	0.666
	Female	52	72.2%	20	27.8%	
Age group (Yrs)	<30	22	73.3%	8	26.7%	0.938

	30-39	25	69.4%	11	30.6%	
	40-49	12	66.7%	6	33.3%	
	>50	12	75.0%	4	25.0%	
BMI	Normal < 25 kg/m <sup>2</sup>	6	85.7%	1	14.3%	0.531
	Overweight 25-29 kg/m <sup>2</sup>	42	72.4%	16	27.6%	
	Obese ≥ 30 Kg/m <sup>2</sup>	23	65.7%	12	34.3%	
Spillage(bile &/or stones)	Yes (21)	15	71.4%	6	28.6%	0.961
	No (79)	56	70.9%	23	29.1%	
Wash by N.S.	Yes (42)	23	54.8%	19	45.2%	0.002
	No (58)	48	82.8%	10	17.2%	
Duration of surgery	≤ 30minutes (48)	22	57.9%	16	42.1%	0.024
	>30 minutes (62)	49	79.0%	13	21.0%	



**Figure- 5** Comparison between two groups according to wash by normal saline.



(Figure- 6) Comparison between two groups according to duration of surgery.

Group A no.	Start of pain			
	Day zero		Day 1	
71	Count	%	Count	%
		46	64.8	25

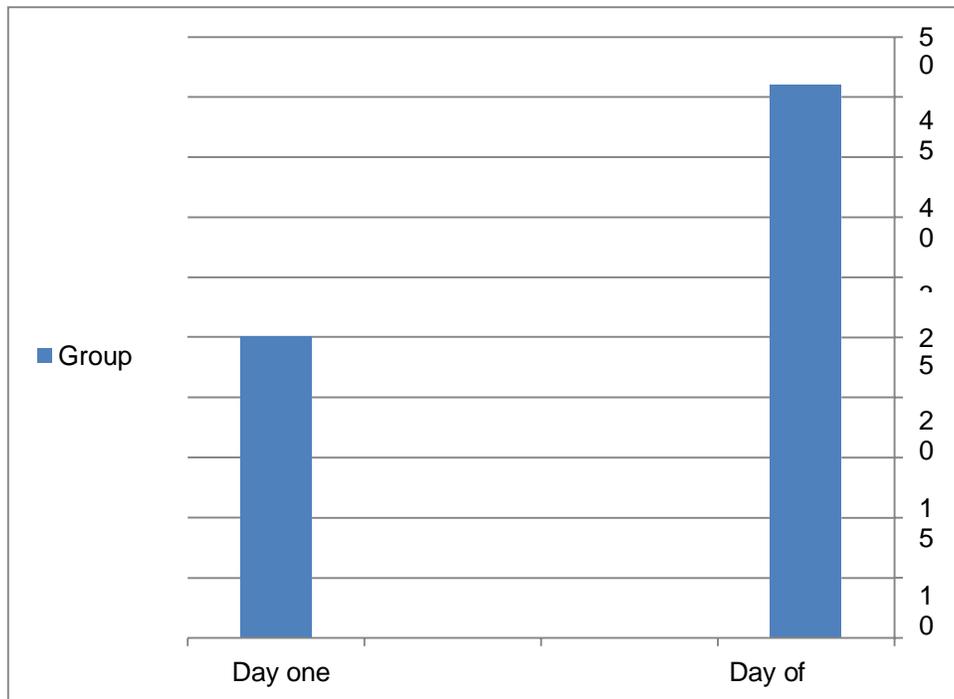
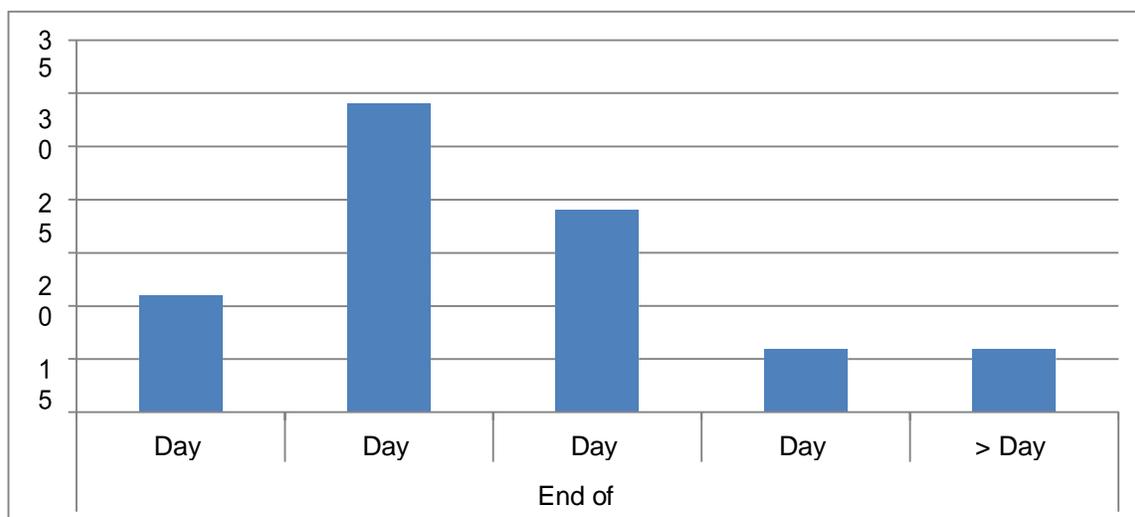


Fig. 7 postoperative distribution of start of shoulder pain

Table-5 showing pain severity				
Group A	Pain severity			
	Mild		Moderate	
	N	%	N	%
71	54	76	17	24

Table-6 show the start of shoulder pain						
Wash by N.s.	No.	start of pain				PV
		day zero		first day		
		Count	%	Count	%	
		28	58.3%	20	41.7%	0.1
	Yes	18	78.3%	5	21.7%	

Table – 7 show time of disappearance of shoulder pain										
Group A no.	End of pain									
71	D2		D3		D4		D5		>D5	
	Count	%	Count	%	Count	%	Count	%	Count	%
		13	18.3	27	38	19	26.8	6	8.5	6



**Fig – 8** distribution of disappearance of pain.