Journal of Chitwan Medical College 2021;11(37):53-57
Available online at: www.jcmc.com.np

ORIGINAL RESEARCH ARTICLE

ASSESSMENT OF POSTOPERATIVE PAIN AND ANALGESIC USE IN PATIENTS UNDERGOING ORTHOPEDIC SURGERY

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Received: 4 Jul, 2021
Accepted: 24 Aug, 2021
Published: 30 Sep, 2021

Key words: Analgesic; Orthopedics; Pain; Post-operative.

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Citation

Sharma BB. Sitaula J. Assessment of postoperative pain and analgesic use in patients undergoing orthopedic surgery. Journal of Chitwan Medical College.2021;11(37):53-7.

Peer Reviewed

ABSTRACT

Background: Pain is an unpleasant sensation and occurs frequently in the post-operative period. Pain impairs treatment and recovery of patients and thus should be adequately managed. This study aimed to assess the intensity of pain in the post-operative patients undergoing orthopedic surgery and to evaluate the adequacy of the analgesics used.

Methods: This was a prospective observational study conducted at Chitwan Medical College, Department of Orthopedics from May to August 2019. Ninety-six patients who underwent orthopedic surgery were evaluated upto 72 hours after surgery and assessed for pain using interview, Visual Analogue Scale and medical record analysis. Type of analgesic used and its adequacy, using Pain Management Index, were also studied.

Results: There were 58 male and 38 female patients with age 18-79 years (mean 38.16 ± 16.34 years). 97.9% patients complained of pain in immediate, 91.7% in 1st and 82.3% in 2nd post-operative period with mean Visual Analogue Scale scores of 6.68, 3.74 and 2.68 respectively. Non-steroidal anti-inflammatory drug was the most frequently prescribed analgesic followed by its combination with opioid. Pain management was inadequate in immediate post-operative (61.5%), but there was significant improvement in 1st and 2nd post-operative period (inadequate Pain Management Index in 28.1% and 12.5% respectively).

Conclusions: Most patients experienced pain in the post-operative period, but the intensity decreased as the post-operative hours passed by. Pain management in the immediate post-operative period was inadequate in our study and therefore proper attention should be given to manage pain in the post-operative period.

INTRODUCTION

Pain is one of the main consequences of trauma and inadequate pain control in the postoperative period may affect management and recovery of the patient. In the postoperative period, orthopedic patients have pain due to trauma-related tissue injury, nature of the surgical procedure,[1] lack of pain evaluation, and inadequate use of analgesics.[2,3]

Although the patient care has improved nowadays, studies show that postoperative pain continues to be inadequately treated and patients still suffer moderate to severe pain after surgery[4,5] and orthopedic surgery is one of the most painful surgeries.[6, 7]

Postoperative pain management is crucial for the care of orthopedic surgery patients. However this aspect of pain management has not been investigated much in our country. In this context, the aim of this study was to assess the intensity of pain in patients during the postoperative period of orthopedic surgeries and to evaluate the adequacy of the analgesia used.

METHODS

This was a prospective observational study with a quantitative research design. The study was conducted from May to August 2019 at Chitwan Medical College Teaching Hospital (CMC-TH), Department of Orthopedics. Sample size was calculated based on data from the previous year. Out of total patients taking services from the orthopedics department at CMC-TH, 5.9% required surgical intervention. Taking this as population proportion estimated sample size was 86 (n=85.3) with 95% confidence level and 5% allowable error. Using convenience sampling, the first 100 patients who underwent orthopedic surgery meeting the inclusion criteria were enrolled for the study.

Inclusion criteria included patients aged > 18 years capable of communicating verbally who gave consent for the study. Unconscious patients, patients who had undergone spine surgeries or those with surgeries done under local anesthesia were excluded.

Data collection was done using the proforma which included a predetermined patient questionnaire and the visual analogue scale (VAS) for pain. Data were acquired from interviews with the patients and review of their medical records. Approval for the study was taken from the Institutional Review Committee

of Chitwan Medical College. Informed consent was taken from all the participants after properly explaining the nature and purpose of the study.

Statistical data analysis was done using the SPSS (Statistical Package for Social Sciences) version 16.0. Analysis was done using frequencies, descriptive options for mean and standard deviation, and Friedman's 2-way ANOVA. Values of $p < 0.05$ were taken to indicate significance with a confidence interval of 95%.

After the surgery, patients were followed up for 72 hours in the postoperative ward and the general orthopedic ward. Assessment was done once a day during the immediate postoperative period IPO (until 24 hours after surgery), 1st postoperative period 1st PO (24-48 hours after surgery) and 2nd postoperative period 2nd PO (48-72 hours after surgery).

Patients were interviewed for pain assessment- whether they slept comfortably at night, presence or absence of pain, scoring of pain, and localization of pain:[8] surgical incision, lower limbs, upper limbs, head, back and/or the entire body. Pain was quantified using the Visual analogue scale (VAS)[9] score on a 10 cm scale: 0= no pain, 10= worst pain. Pain intensity (PI) was categorized as: no pain (VAS 0), mild pain (VAS 1-4), moderate pain (VAS 5-7), and severe pain (VAS 8-10).[10, 11]

Medical records of patients were studied to look for physiological changes during pain- tachycardia, tachypnea, change in blood pressure and change in temperature. The following parameters were considered to identify the changes: tachycardia (heart rate >100 beats/minute), tachypnea (respiratory rate >20/minute), change in blood pressure (<100/60 mmHg or ≥140/90 mmHg), and change in body temperature (axillary temperature <96.8^{0}F or ≥98.7^{0}F).[11]

Analgesics prescribed to the patients were grouped into simple analgesics (paracetamol), non-steroidal anti-inflammatory drugs (NSAIDs) and opiates.[12]

Adequacy of analgesia was assessed using pain management index (PMI).[8, 13] Analgesic potency (AP) was classified as: 0-no analgesic drug, 1- NSAIDs, 2- weak opioid (codeine, tramadol) and 3 -strong opioid (morphine, fentanyl).[8] Pain intensity (PI) was classified as: 0- no pain, 1- mild pain, 2- moderate pain and 3- severe pain. PMI was obtained by subtracting pain intensity from analgesic potency (PMI = AP –PI). PMI can thus range from −3 (a patient with severe pain receiving no analgesic drug) to +3 (a patient receiving a strong opioid and reporting no pain). A negative PMI score indicates inadequate pain management, and 0 or higher score indicates adequate pain management.

RESULTS

The study population consisted of 100 patients who had undergone orthopedic surgery. Three patients were discharged before the third assessment could be done and one patient had an incomplete medical record, and thus excluded from the study. Final analysis was done with 96 patients.

There were 58 male and 38 female patients in our study with a mean age of 38.16 ± 16.34 years (range 18-79 years) and the majority were young adults (18-49 years, 74%; Table 1). Road traffic accidents (RTA) were the most common mode of injury (62.5%) and limbs were most commonly affected- upper limb 43.8% and lower limb 42.7% (Table 2).

Table 1: Socio-demographic data of patients undergoing orthopedic surgery (n = 96)

Variable	Frequency (%)
Male/Female, n	58/38
Age group, n (%)	
18-29 years	33 (34.4%)
30-39 years	23 (24%)
40-49 years	15 (15.6%)
50-59 years	12 (12.5%)
≥ 60 years	13 (13.5%)
Education, n (%)	
Illiterate	16 (16.7%)
Up to 10	53 (55.2%)
More than 10	27 (28.1%)
Use of alcohol (Yes/No), n	32/64
Use of illicit drugs (Yes/No), n	4/92
Presence of chronic disease (Yes/No), n	18/78

Table 2: Fracture characteristics of patients undergoing orthopedic surgery (n = 96)

Variable	Frequency (%)
Mechanism of injury, n (%)	
Road Traffic Accident	60 (62.5%)
Fall	31 (32.3%)
Others	5 (5.2%)
Type of fracture, n (%)	
Traumatic/Pathological	95/1 (99% / 1%)
Open/Closed	12/84 (12.5% / 87.5%)
Location of fracture, n (%)	
Upper limb	42 (43.8%)
Lower limb	41 (42.7%)
Hip	6 (6.3%)
Pelvis	7 (7.3%)
Type of surgery, n (%)	
Elective	92 (95.8%)
Emergency	4 (4.2%)
Type of anesthesia, n (%)	
Regional	74 (77.1%)
General	7 (7.3%)
Regional + intravenous	15 (15.6%)

With regards to pain, 94 patients (97.9%) complained of pain in the IPO, 88 patients (91.7%) in 1st PO and 79 patients (82.3%) in 2nd PO. The mean VAS scores were 6.68, 3.74 and 2.68 in the IPO, 1st PO and 2nd PO respectively, and the reduction in pain score was statistically significant (Freidman test, $\chi2(2) = 112.595$, $p = 0.000$).

There was predominance of moderate to severe pain in the IPO (41.7% each) whereas patients complained of mild to moderate pain in 1st PO (47.9% mild, 37.5% moderate) and 2nd PO (63.5%

mild, 18.8% moderate). There were 26 patients (27.1%) in the IPO who could not sleep comfortably at night due to pain, and this number decreased to two (2.1%) and three (3.1%) patients in the 1st PO and 2nd PO respectively.

As for physiological changes in patients during the postoperative period, the most frequent change was tachypnea (Table 3). The associations between pain and the presence of physiological changes were not statistically significant (p>0.05, Spearman correlation) except for change in body temperature (p=0.028) in the IPO.

The most frequently prescribed analgesic was NSAID followed by a combination of NSAID and opioid (Table 4).

Table 3: Physiological changes in patients during the postoperative period (n = 96)

Physiological changes	IPO	1st PO	2nd PO
Tachycardia	20 (20.8%) (p=0.989)	11 (11.5%) (p=0.251)	6 (6.3%) (p=0.867)
Tachypnea	73 (76.0%) (p=0.318)	74 (77.1%) (p=0.302)	60 (62.5%) (p=0.314)
Change in blood pressure	17 (17.7%) (p=0.716)	8 (8.3%) (p=0.341)	3 (3.1%) (p=0.703)
Change in body temperature	32 (33.3%) (p=0.028)*	30 (31.3%) (p=0.337)	24 (25.0%) (p=0.058)

*p value < 0.05

Table 4: Analgesics used in the postoperative period (n = 96)

Analgesics	IPO	1st PO	2nd PO
NSAID + simple analgesic + opioid	7 (7.3%)	7 (7.3%)	6 (6.3%)
NSAID + simple analgesic	4 (4.2%)	10 (10.4%)	10 (10.4%)
NSAID + opioid	29 (30.2%)	18 (18.8%)	8 (8.3%)
Simple analgesic + opioid	2 (2.1%)	8 (8.3%)	6 (6.3%)
NSAID	41 (42.7%)	40 (41.7%)	53 (55.2%)
Simple analgesic	1 (1.0%)	3 (3.1%)	2 (2.1%)
Opioid	9 (9.4%)	7 (7.3%)	9 (9.4%)
No drug	3 (3.1%)	3 (3.1%)	2 (2.1%)

The frequency of opioid prescription decreased from IPO (47 patients, 49%) to 2nd PO period (29 patients, 30.2%), with corresponding increase in use of NSAIDs. Only six, three and two patients (6.3%, 3.1% and 2.1%) received strong opioid in the IPO, 1st PO and 2nd PO period respectively (Table 5).

With regards to adequacy of pain management, there was a significant improvement in pain management index from immediate to 1st postoperative period ($\chi^2(2) = 68.605$, p = 0.000) (Table 6).

Table 5: Distribution of patients (n=96) according to analgesics received and pain intensity in IPO, 1st PO and 2nd PO

Post-op	Analgesic	Pain Intensity				Total
		No pain	Mild	Moderate	Severe	
IPO	No drug	0 (0.0%)	1 (1.0%)	1 (1.0%)	1 (1.0%)	3 (3.1%)
	NSAID	1 (1.0%)	6 (6.3%)	21 (21.9%)	18 (18.8%)	46 (47.9%)
	Weak opioid	1 (1.0%)	7 (7.3%)	16 (16.7%)	17 (17.7%)	41 (42.7%)
	Strong opioid	0 (0.0%)	0 (0.0%)	2 (2.1%)	4(4.2%)	6 (6.3%)
	Total	**2 (2.1%)**	**14 (14.6%)**	**40 (41.7%)**	**40 (41.7%)**	**96 (100%)**
1st PO	No drug	1 (1.0%)	1 (1.0%)	0 (0.0%)	1 (1.0%)	3 (3.1%)
	NSAID	5 (5.2%)	26 (27.1%)	21 (21.9%)	1 (1.0%)	53 (55.2%)
	Weak opioid	2 (2.1%)	19 (19.8%)	13 (13.5%)	3 (3.1%)	37 (38.5%)
	Strong opioid	0 (0.0%)	0 (0.0%)	2 (2.1%)	1 (1.0%)	3 (3.1%)
	Total	**8 (8.3%)**	**46 (47.9%)**	**36 (37.5%)**	**6 (6.3%)**	**96 (100%)**
2nd PO	No drug	1 (1.0%)	1 (1.0%)	0 (0.0%)	-	2 (2.1%)
	NSAID	14 (14.5%)	40 (41.7%)	11 (11.5%)	-	65 (67.7%)
	Weak opioid	2 (2.1%)	19 (19.8%)	6 (6.3%)	-	27 (28.1%)
	Strong opioid	0 (0.0%)	1 (1.0%)	1 (1.0%)	-	2 (2.1%)
	Total	**17 (17.7%)**	**61 (63.5%)**	**18 (18.8%)**	**-**	**96 (100%)**

Table 6: Pain management evaluation in different postoperative periods (n = 96)

PMI	IPO	1st PO	2nd PO	p value*
Adequate	37 (38.5%)	69 (71.9%)	84 (87.5%)	0.000
Inadequate	59 (61.5%)	27 (28.1%)	12 (12.5%)	

*Friedman test

DISCUSSION

There is a challenge to assess pain as experience of pain is subjective and not all patients are able to report this clearly and effectively.[14, 15] Orthopedic surgery being a cause of pain in the peri-operative period, pain control should be given greater attention.

This study showed that pain was present throughout in the immediate, first and second postoperative period, most common being in the IPO; whereas study of Barbosa et al[11] found highest (75%) in the 2nd postoperative period, with only 65.7% having pain in the IPO - there was predominance of mild pain in IPO and 2nd POP (39.7% and 55.5% respectively) and moderate pain in 1st POP (36.3%). In our study moderate to severe pain predominated 41.7% each in the IPO period. Pain intensity was reduced to mild to moderate in 1st and 2nd postoperative period (1st POP- 47.9% mild, 37.5% moderate; 2nd POP- 63.5% mild, 18.8% moderate). This is similar to the study of Tarkkila et al[16] where 90% patients complained of moderate or severe pain after major knee surgery. It is obvious that pain intensity will decrease with the passage of time from immediate to 1st and 2nd postoperative period, as was the case in our study. The difference with the study of Barbosa et al[11] was probably because they did not assess 60.4% patients in the 1st POP and 54.7% in the 2nd POP for having been previously discharged during that period.

We found no significant association between pain and physiological changes in the postoperative period except for change in body temperature. These findings are similar to the study by Barbosa et al,[11] who also found no significant association. Another study by Andrade et al[14] done in the postoperative period of cardiac surgeries showed that pain and physiological changes were associated with statistical significance. This association was probably because the surgery done on the heart caused the physiological alterations in the body, whereas orthopedic surgery did not have a significant effect on the physiology.

In our study only 38.5% had adequate pain management in the IPO, but this number increased to 71.9% and 87.5% in the 1st PO and 2nd PO period respectively which was statistically significant. This is similar to the study by Calil et al[8] which shows analgesic inadequacy in the first evaluation and better analgesic adequacy in the second evaluation. Kawai et al[17] observed that 74% and 81% of orthopedic patients had adequate analgesia before and after surgery respectively. This inadequate pain management in the initial postoperative period was likely due to improper pain assessment during this period. The improvement in the pain management in subsequent time periods might also be due to the fact that the pain intensity decreased from severe-moderate to moderate-mild, and thus the analgesics prescribed could adequately manage the pain.

In the IPO 80 patients (83.3%) had moderate to severe pain and 47 patients (49%) received opioids. However, only 39 out of these 80 patients (48.8%) received opioids. Similarly there were 42 (43.8%) and 18 (18.8%) patients with moderate to severe pain, and 40 (41.7%) and 29 (30.2%) patients received opioids in 1st and 2nd postoperative day respectively. Only 19 out of 42 (45.2%) patients and seven out of 18 (38.9%) patients with moderate to severe pain received opioids in 1st and 2nd postoperative day respectively. This shows an obvious negative pain management index. In the study of Kawai et al[17] 45% patients had moderate to severe pain and 87% received weak opioids in the postoperative period. The practice of pain control in our institution is mainly through administration of analgesic drugs via intravenous, intramuscular or oral route, most commonly NSAIDs. Other methods like epidural opioids and patient-controlled analgesia are not frequently used in our scenario and thus account for the inadequate pain management in the postoperative period. There were also patients who had no or mild pain and still received some form of opioids- eight out of 16 (50%), 21 out of 54 (38.9%) and 22 out of 78 (28.2%) patients with no to mild pain received opioids in the IPO, 1st PO and 2nd PO period respectively.

There should be emphasis in better pain assessment and management by doctors and ward nurses for care, comfort promotion and pain relief in the postoperative period. Adequate analgesia must be provided in the postoperative period with "set time" and "as required" plan and must include opioids. Patient-controlled analgesia may be an effective option which allows the patient to titrate the drug dose to his/her need.

Our study is not without limitations. There was no comparison between groups of patients (younger and older) and pain management in this study. Similarly we did not take into consideration the use of analgesics in the pre-operative period. Also assessment of pain was subjective and thus many patients could not have been able to perceive their pain levels correctly.

CONCLUSION

The majority of the patients reported pain in the postoperative period the intensity decreased from moderate to severe in the immediate postoperative period to mild to moderate in the first and second postoperative period. There was no significant association between pain and physiological changes in the postoperative period except for change in body temperature. NSAID was the predominantly administered analgesic followed by the combination of NSAID and opioid. Also pain management in the immediate postoperative period was inadequate.

As pain was a constant phenomenon throughout the periods studied, greater attention should be given to assess and manage pain. This should be a team approach including nurses, surgeons and anesthetists to improve the quality of care provided to the patients.

ACKNOWLEDGEMENTS

The authors are thankful to the nursing staff of postoperative and orthopedic wards for their assistance.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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