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OBSERVATIONAL STUDY OF ANALGESIC AND PAIN RELIEF IN POSTOPERATIVE PATIENTS

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ABSTRACT

The aim of this study was to observe the use of analgesic pattern and pain intensity outcomes in postoperative patients. The study was conducted on postoperative patients at Universitas Airlangga Teaching Hospital Surabaya in the periode of April to Mei 2017. Recording the use of analgesics and pain assessment was done during hospitalization, at early postsurgical until the patients discharge. Results of 116 patients' postoperative patients showed the analgesics used were mefenamic acid, ketorolac, metamizole, paracetamol and tramadol used as a single and analgesics combination. Combination therapy was got by 45% of patients. Pain assesment showed 75% of patients without pain and mild pain, 24% with moderate pain, 2% got severe pain at the early postsurgical. At discharge time 97% of patients without pain and mild pain, 3% with moderate pain, and no patient with severe pain. Inconclusion, nociceptic pain experienced by postoperative patients and pain management has provided good outcomes, but there are still 2% of patients with severe early postoperative pain requiring better management from interprofessional health care.

Key words: Analgesic, postoperative pain, nociceptic pain, pain relief

INTRODUCTION

Postoperative pain is acute pain experienced after surgery and has a rapid or sudden onset and in a short period of time. This is a predictable condition caused by trauma and inflammatory processes, ie, tissue damage that causes the body to produce pain mediators during the surgical procedures including skin incision, tissue dissection, manipulation, and traction. The type of postoperative pain is primarily nociceptive (Pogatzki-zahn et al., 2017). Postoperative pain triggers a stress response, an endocrine neuro response that affects mortality and various morbidities of postoperative complications (Tennant, 2004).

The understanding of the mechanism of postoperative pain has undergone considerable progress, but postoperative pain management has

not been optimal (Apfelbaum and Chen, 2003). Globally, the prevalence of postoperative pain ranges from 50% to 75% of total surgical patients (Philip et al., 2007). More than 80% of patients undergoing surgical procedures experience acute postoperative pain and about 75% of those reported postoperative pain with severity ranging from moderate, severe or extreme (Gan et al., 2014). Other studies have reported that 41% of patients experien postoperative pain with moderate and severe pain levels on day 0. Even, the prevalence of moderate and severe pain was increased in the type of abdominal surgery, extremity surgery, and back/spinal surgery (Sommer et al., 2008).

Unresolved acute pain can provide significant psychological consequences, starting from uncomfortable sleep to the stage of development of Post-Traumatic Stress Disorder (PTSD) (Tennant, 2004). Handling of inadequate pain therapy can have a negative effect on quality of life, recovery of body function, risk of complications and postoperative painful pain. In addition, the patient's rehabilitation process can be delayed, resulting in longer hospitalization time (Morrison et al., 2003). Other effects that may arise include increased risk of side-effects, such as the development of chronic disease, suppression of immune cells, long wound healing operations, and increased activation of adrenergic hormones and their risks in the form of coronary heart disease or gastrointestinal cell damage, difficulty in moving can trigger thromboembolism (Misiotek et al., 2014). Analgesics are necessary for adequate postoperative pain control to avoid postoperative complications and speed up the recovery process of patients (Chaturvedi and Chaturvedi, 2007; Clark, 2002). To overcome pain effectively, several factors need to be considered, from the cause of pain, degree of pain, type selection and analgesic dosage to be used, route of administration, and frequency of administration (Apfelbaum and Chen, 2003). The aim of this study is to observe the use of analgesic patterns and pain intensity outcomes in postoperative patients.

MATERIAL AND METHODS

This study was observational prospective, conducted at Inpatient Care Unit of Universitas Airlangga Hospital Surabaya, from April to May 2017. The sample of this study is all patients who have undergone surgery during that period. Inclusion Criteria include ≥ 17 year old adult patients undergoing hospitalization, and using analgesics as pain therapy. Exclusion criteria include inpatients due to trauma, patients with communicating disorders such as epilepsy and seizures. The parameters observed were patient characteristics, diagnosis & type of surgery, analgesic therapy, and pain assessment right after surgery and before hospital discharge.

RESULT AND DISCUSSION

During the study period, 116 patients have been obtained as sample. Patient characteristics data listed in Table 1. The number of female patients was 62.9% and male patients was 37.1%. The age of the patients is divided into 4 categories according to the MOH RI (2009). The patient's age ranges from 17-70 years old. Most patients were early adult (26-35 years), as much as 31.03%. The sample of patients in this study came from 8 surgical units, with the big 3 groups of surgical units were general surgery 49.1%, obstetry gynecology surgery 31.90%, and thoracic cardiovascular surgery 7.76%.

Table 1. Patient characteristic

Characteristic	Number of patients (%)
Sex	
Male	43 (37,1)
Female	73 (62,9)
Age (years)	
17-25	17 (14,7)
26-35	36 (31,0)
36-45	20 (17,2)
46-55	21 (18,1)
56-65	15 (12,9)
>65	7 (6,0)
Surgery Unit	
General surgery	57 (49,1)
Obstetry gynecology surgery	38 (32,8)
Thoracic Cardiovascular surgery	9 (7,8)
Orthopaedic surgery	5 (4,3)
Oral surgery	3 (2,6)
Neurosurgery	2 (1,7)
Urosurgery	1 (0,9)
Plastic surgery	1 (0,9)

Postoperative pain is an acute pain caused by surgery or tissue injury. The intensity of this acute pain may be affected by the type of surgery / surgical technique and / or patient conditions before surgery such as chronic pain, depression, and anxiety that may affect the pain threshold (Pogatzki-zahn et al. 2017). Appropriate analgesic selection becomes the main foundation in the management of postoperative pain therapy in order to improve the quality of life of the patient. The American Society of Anesthesiologists recommend therapies for treating postoperative pain such as NSAIDs, COXIB, and / or acetaminophen for mild to moderate

postoperative pain, and parenteral ketorolac can be used for moderate to severe pain. For moderate to severe postoperative pain should be preceded by opiod analgesic therapy with or without NSAIDs (American Society of Anesthesiologists Task Force on Acute Pain Management, 2012).

The analgesic type used for pain management in this study can be seen in Table 2. From Table 2 it can be seen that single and combination analgesics are used in postoperative patients. Acute pain caused by an incision, will lead to the release of inflammatory mediators (prostaglandins, cytokines, bradykinins) peripherally. This process is followed by a transductions to the dorsal horn and to the brain, pain perception occurs and then there is the process of modulating pain in the brain pathway to the spinal cord that affects the intensity and duration of pain (Gupta, 2011). Therefore, a multimodal analgesic therapy approach is required by administering two or more types of analgesics through different mechanisms of action. It is intended to overcome pain as an effective post-operative pain management strategy without increasing the risk of side effects compared with increasing the dosage of a single analgesic. For example, intravenous opioid administration may be combined with NSAIDs (Chou et al., 2016).

In this study, the five most common types of analgesics used were ketorolac 65.5%, mefenamic acid 46.5%, tramadol 31.9%, metamizole 31.03% and paracetamol 18.9%, (Figure 1). Ketorolac is a potent NSAIDs that works by inhibiting the Cyclooxygenese (COX) enzyme that metabolizes arachidonic acid into endoperoxide and prostaglandins that mediate pain (Gopalraju et al., 2014). Adult dose of intravenous ketorolac is 15-30 mg every 6 hours with a maximum dose of 120 mg/day. The dose of ketorolac used in this study is accordance with the guideline (McEvoy, 2011).

Ketorolac can cause ulcer in gastrointestinal tract and bleeding. Ketorolac has the highest GIT bleeding potential compared to other NSAIDs. A study by Strom et al. (1996) suggests that the risk of gastrointestinal bleeding increases in the administration of high dose ketorolac, elderly patients, and more than 5 days (Strom et al., 1996). In addition, ketorolac dose 3x10mg did not provide different analgesic effectiveness with a dose of 15 mg and 30 mg in overcoming moderate to severe pain without any increased risk of side effects (Motov et al., 2017). Another study carried out by Duttchen (2017) states that ketorolac 30 mg is no more superior than ketorolac 15 mg iv in spinal surgery patients (Duttchen et al., 2017). Therefore, the use of ketorolac should be limited to minimum dose and duration, and at maximum of 5 days for oral and parenteral routes. In this study the majority of ketorolac used in 1-2 days, no more than 5 days (Table 3).

Table 2. Analgesics type and administration as single and combination therapy

Analgesik	Type	Number of patients (%)
Single analgesic		
Mefenamic acid	NSAIDs	48 (41,38)
Ketorolac	NSAIDs	51 (43,97)
Metamizole	NSAIDs	28 (24,14)
Paracetamol	Non opioid	8 (6,90)
Tramadol	Opioid	7 (6,03)
2 analgesics combination		
Ketorolac + tramadol	NSAIDs + opioid	25 (21,55)
Metamizole + tramadol	NSAIDs + opioid	5 (4,31)
Ketorolac + paracetamol	NSAIDs + non opioid	1 (0,86)
Ketorolac + mefenamic acid	NSAIDs + NSAIDs	2 (1,72)
Ketorolac + metamizole	NSAIDs + NSAIDs	4 (3,45)
Metamizole + paracetamol	NSAIDs + non opioid	4 (3,45)
Tramadol + paracetamol	Opioid + non opioid	4 (3,45)
Metamizole + mefenamic acid	NSAIDs + NSAIDs	3 (2,59)
> 2 analgesics combination		
Paracetamol + mefenamic acid + metamizole	Non opioid + NSAIDs + NSAIDs	1 (0,86)
Ketorolac + mefenamic acid + paracetamol	NSAIDs + NSAIDs + non opioid	1 (0,86)
Paracetamol + ketorolac + tramadol	Non opioid + NSAIDs + opioid	1 (0,86)
Metamizole + ketorolac + tramadol + mefenamic acid	NSAIDs + NSAIDs + opioid + NSAIDs	1 (0,86)

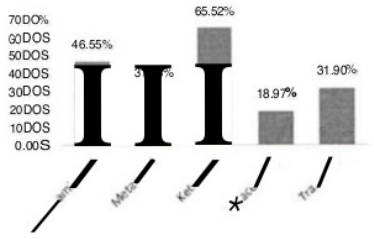

Figure 1. The five most common types of analgesics used by postoperative patients at the Inpatient Care Unit of Universitas Airlangga Hospital from April to May 2017 (1 patient can obtain more than 1 analgesic during hospitalization).

Another common use of analgesics was oral mefenamic acid (46.55%) with duration of administration 1 to 3 days, and metamizolee intravenously (31.03%) with duration of administration 1 to 5 days (Table 3). The selection of NSAIDs types is adjusted to the individual patient condition, including the risk of side effects, contraindications, and available dosage forms (Misiotek et al., 2014). Mefenamic acid has the same mechanism as ketorolac, while metamizole provides a lower analgesic effect than other NSAIDs. At Universitas Airlangga Hospital, metamizole is often used as single or combination analgesic therapy in postoperative patients for moderate to severe pain management. The most widely dose regimen of metamizole is 3x1 g iv. Metamizole has a special characteristic of low gastrointestinal side effects and low toxicity in the kidney compared to other analgesics, but there is also other potential risk of agranulocytosis (Nikolova et al., 2013, 2013).

Another nonopioid analgesics used in postoperative patients is oral and intravenous paracetamol. Paracetamol is used for duration 1-5 day in the following dose: 3-4 x 500-1000 mg orally, combination 500 mg paracetamol and 200 mg n-acetylcysteine 3x1 oral tablet. Paracetamol is recommended as a first choice analgesic for mild to moderate pain because its lower postoperative GIT bleeding risks compared with NSAIDs (Chou et al., 2016). Unlike NSAIDs that inhibit COX enzymes, Paracetamol works by inhibiting the synthesis of prostaglandins in the central nervous system, and inhibiting the activation of nociceptors in the periphery. In addition, paracetamol also acts in inhibiting the raising the sensitivity of pain in the spinal cord (Khalili et al., 2013). Dose recommendation of paracetamol is 325-1000 mg every 4-6 hours with a maximum dose of 3-4 g/day (McEvoy, **2011).**

Intravenous paracetamol is used as an additional (extra) therapy for patient who still feels pain. The given dose is 3x1 g. It is is an appropriate therapy for mild and moderate postoperative pain, and may be used alone or combination with other analgesic drugs (Memis et al., 2010). It is also can reduce the use of opioids, thereby decreasing the side effects of opioids such as nausea and vomiting. Previous studies have suggested that when paracetamol is given as prophylaxis, it can decrease the incidence of Postoperative Nausea and Vomiting (PONV) (Apfel et al., 2013). The advantage of intravenous paracetamol is the time for achieving the maximum concentration (15 min after intravenous) much shorter than oral or rectal route (> 45 min). Other benefits include improving pain relief, improving patient satisfaction, accelerating rehabilitation and mobilization and lowering health care costs (Pasero and Stannard, 2012).

Opioid analgesics used in postoperative patients were tramadol with the most doses used were 3x100mg iv in NS 100cc (27.59%). Other doses are

2-3 x 30-50mg iv, and oral combination of tramadol 37.5 mg and paracetamol tablets 325mg. The duration of tramadol administration in the patients was an average of 1-4 days, but there was 1 patient who received tramadol for 10 days ie patients with thrombectomy surgery (Table 3). There is no specific maximum duration of tramadol administration. However, the use of tramadol for 1-2 weeks needs dose reduction up to 20-25% even 1-2 days to reduce the risk of side effects and prevent withdrawal (Chou et al., 2016). Tramadol is a weak opioid analgesic that effective for moderate pain treatment. However, the use of opioids in postoperative patients may induce nausea and vomiting, particularly in abdominal surgery (Spacek et al., 2003). Slow intravenous injection will reduce the incidence of nausea and vomiting. Therefore, tramadol is given as intermittent injection to reduce the incidence of nausea and vomiting (Sim et al., 2007).

Table 3. Duration of analgesic therapy

Analgesic	Regimentation	Number of patients					
		1 day	2 days	3 days	4 days	5 days	10 days
Ketorolac	3x10mg iv	1					
	3x30mg iv	60	12	2	1	1	
	3x30mg iv		1				
Tramadol	3x50mg iv	1					
	3x100mg intermittent iv	26	6		1		1
	2x50mg iv	1					
	2xltab oral	1					
Metamizole	1x1g iv	7					
	2x1g iv	4					
	3x1g iv	9	10	1	1	1	
	3x1 tab oral	1					
Paracetamol	3x500mg oral	3	2			1	
	4x500mg oral	3	1	2			
	4x1000mg oral			1			
	4x750mg intermittent iv				1		
	3x1000mg intermittent iv	3	2				
Mefenamic	3x500mg PO	32	12	1			
Fentanyl patch	1x12,5mg			1			

Table 4. Initial & before hospital discharge postoperative pain intensity at surgery units

Surgery unit	Number of patients based on initial & before hospital discharge postoperative pain intensity (%)								Number of patient
	No symptom Initial	No symptom Discharge	Mild pain Initial	Mild pain Discharge	Moderate pain Initial	Moderate pain Discharge	Severe pain Initial	Severe pain discharge	
General surgery	13 (11.2)	20 (17.2)	30 (25.8)	36 (31,0)	12 (10,3)	1 (0.9)	2 (1.7)		57 (49,1)
Ortho-paedy Surgery	3 (2.6)	3 (2.6)	2 (1,7)	2 (1.7)					5 (4,3)
Thoracic Cardio surgery	3 (2.6)	3 (2.6)	6 (5, 1)	6 (5,1)					9 (7.8)
Uro-surgery			1 (0,9)	1 (0,9)					1 (0,9)
Neuro-surgery	1 (0,9)	1 (0.9)	1 (0,9)	1 (0.9)					2 (1.7)
Obstetry Gyneco-logy surgery	2 (1.7)	15 (12.9)	21 (18,1)	22 (19,0)	15 (12.9)	1 (0.9)			38 (32,8)
Oral surgery	1 (0.9)	1 (0.9)	2 (1.7)	2 (1.7)					3 (2.6)
Plastic surgery	1 (0.9)	1 (0,9)							1 (0.9)
Total	25 (21.6)	44 (37,9)	62 (53,4)	70 (60,3)	27 (23,7)	2 (1,7)	2 (1,7)	0 (0,0)	116 (100)

Percentage (%) is counted based on 116 patient total; Pain intensity is measured by *Visual Analog Scale* (VAS); No symptom: did not show pain symptoms and/or VAS 0; Mild pain: VAS 1-3; moderate pain: VAS 4-6; Severe pain: VAS 7-10

Analgesics were administered via intravenous, oral, and transdermal routes (Table 3). Intravenous route is used at the beginning of postoperative, it is expected that this route will provide rapid analgesic work (Shargel et al., 2012). Oral route analgesics are used when the patient's pain has decreased and the patient can perform swallowing activity. In this study, there was 1 patient receiving patch analgesic. This method of administration is less precise. Patch analgesics are aimed in patients with chronic pain, whereas postoperative pain is an acute pain (Chou et al., 2016; Wu and Raja, 2011).

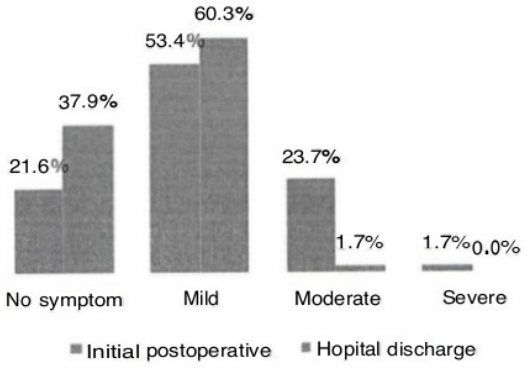

Figure 2. Initial and before discharge Postopera Pain intensity in surgery units

Analgesic replacement occurs during hospitalization. two of the most replacement are combination ketorolac 3x30mg IV and tramadol 3x100mg IV to oral mefenamic acid 3x500mg, and replacement of single analgesic ketorolac 3x30mg IV to oral mefenamic acid 3x500 mg.

Postoperative patients in each surgical unit have different pain intensities according to the type of surgery. Observation of the intensity of pain on a routine basis and the level of patient satisfaction that has undergone surgery and during hospitalization are two essential points in effective postoperative pain control management (Jawaid et al., 2009). In acute pain management, pain intensity measurements should be performed after 15-30 minutes in patients receiving parenteral route analgesic therapy, and after 1-2 hours in patients with oral analgesics (Chou et al., 2016). Examination of five vital signs at Universitas Airlangga Hospital which includes body temperature, blood pressure, pulse rate, respiratory rate, and pain score and patient complaints are routinely performed three times a day (morning, noon, and night). This is supported by the literature that explains that the assessment of pain, subjective patient complaints, patient response to therapy and side effects that appear should be done every 4-8 hours during the hospitalization. The evaluation was done by checking vital signs and pain intensity before and after the administration of analgesic therapy (Chou et al., 2016).

Common pain scales used to measure pain intensity are Visual Analog Scale (VAS) and Numeric Rating Scale (NRS). VAS has several advantages over other instruments, which are more commonly used in clinical practice, simple to use and provide valid results, and also can be used to measure other variables such as therapeutic side effects or decline pain (Hawker et al., 2011; Jensen et al., 2003). According to WHO 3-Step Ladder, pain intensity is divided into three, ie mild pain (1-3 pain score), moderate pain (pain score 4-6) and severe pain intensity (pain score 7-10).

Research data related to the intensity of postoperative early patient pain showed variation of pain intensity in different surgical units, due to different types of surgery as well as individual factors on the perception of pain itself (Table 4; Figure 2). A total of 21.6% had no pain symptom and 78.42% of patients felt postoperative pain consisting of various intensities as follow: mild pain (53.4%), moderate pain (23.7%), and severe pain (1.7%). This data is supported by a previous study that stated that acute pain occurs in more than 80% of patients who have undergone surgery (Gan et al., 2014).

Assessment of pain intensity before hospital discharge showed an increase in treatment outcomes where 97.4% were in mild pain, 2.6% of patients with moderate pain, and no patients with severe pain (Figure 2).

CONCLUSION

In conclusion, postoperative pain management in Universitas Airlangga Hospital has provided good outcomes, but there are still 2% of patients with severe early postoperative pain requiring better management from interprofessional health care.

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