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ORIGINAL ARTICLE

RISK PREDICTORS FOR THE DEVELOPMENT OF ACUTE POSTOPERATIVE PAIN IN PATIENTS WITH ORTHOPEDIC TRAUMA

CAIO BARROS, ANTONIO CARNEIRO, TOLOMEU CASALI, MILENA MOREIRA

ABSTRACT

Aim: To identify the incidence os acute postoperative pain and predictors for its development.

Methods: Prospective, observacional and longitudinal was conducted in a orthopedic trauma center that is a regional reference, with patients thas had any orthopedic injury and needed surgery. For statistical analysis, patients were divided in four groups (without pain, mild pain, moderate pain and severe pain), acording to analogue visual escale after 24 hours of surgery.

Results: 82 pacients were included. 26 (31,7%) showed moderate to severe pain afer 24 hours postoperative. Three risk fator were associated with pain intensity after 24 hours of surgery: age, pre operative anxiety and pain. Preoperative pain had significantly association.

Conclusion: Patients with preoperative pain had a greater risk of development of acute postoperative pain. Pain intensity is directly related in pre and postoperative periods. Identify these risk factors can guide the pain team in their decisions. In this context, the anesthesiologist has an elementar role on the prevention and control of acute postoperative pain.

KEYWORDS: ACUTE POSTOPERATIVE PAIN; ORTHOPEDIC PROCEDURES; TRAUMATOLOGY CENTERS; RISK FACTORS; OPIOID.

INTRODUCTION

Orthopedic traumas are quite relevant to public health, considering the high number of patients who are victims of this situation. More than 125 million people suffer an orthopedic injury annually[1]. Erivan et al. demonstrated a 59.6% increase in orthopedic surgical procedures in 10 years. Femur fracture was the main type[2]. Orthopedic injuries constitute 50% of injuries admitted to a tertiary trauma center. [3]

Orthopedic surgery is considered one of the procedures most associated with acute postoperative pain (APOP). Many patients complain of severe pain after the surgical procedure, with pain scale scores greater than 6 out of 10 points [4]. Inadequate control of APOP is intrinsically related to the development of chronic postoperative (PO) pain [5] .

The study of APOP pathophysiology has developed over the last 20 years. It is a specific entity resulting from both an inflammatory process and an injury to nerve tissue. But despite the evidence based on experimental studies, there is a difficulty in extrapolating them to clinical practice, delaying the development of more effective treatments for APOP [6].

It is necessary to identify those who are more likely to experience severe APOP and, consequently, have a greater risk of complications [7]. Both severe acute pain and chronic pain have consequences for patients, with increased morbidity, delayed recovery, increased use of opioids, worsening in quality of life in addition to higher costs for health services [8,9].

An observational study with 153 patients undergoing orthopedic surgery showed that smokers, with comorbidities (American Society of Anesthesiologists' physiological status classification - ASA >2) and higher opioid consumption were significant risk factors for severe postoperative pain [5].

Arefayne et al. demonstrated that patients who were anxious prior to surgery and who believed they would feel PO pain are significantly associated with moderate to severe pain 24 hours after the orthopedic surgical procedure [10].

A cohort conducted with surgical patients victims of orthopedic trauma identified female sex and previous surgery as risk factors for severe acute pain [9].

The identification of factors associated with the risk of developing APOP in the preoperative evaluation is essential for signaling patients who will need a more careful approach, helping to control postoperative pain and reducing the consumption of opioids [11].

This is already an opportune moment to share responsibilities for the treatment with the patient, aligning their postoperative expectations with the goals outlined togeth-

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er with the team. Such approaches represent an important step in optimizing perioperative pain management [12].

Therefore, there are pre and intraoperative factors that predispose to the development of APOP, influencing the complete recovery of patients undergoing orthopedic surgical treatment. The identification of these factors can guide the assistant team in the adequate pain management, combating the perpetuation of the nociceptive stimulus and reducing the chances of severe APOP.

OBJECTIVES

To identify risk factors for the development of APOP in patients with orthopedic trauma undergoing surgical treatment.

METHODOLOGY

Type of study and place of development

This is a prospective longitudinal observational study carried out in a tertiary orthopedic trauma center.

Data collection was carried out through the application of questionnaires in November and December 2021 and January 2022. All patients and/or guardians were "clarified about the nature of the research, its objectives, methods, expected benefits, potential risks and the discomfort it could cause them, as far as they are understood and respected in their singularities", meeting the norms of the National Health Council (CNS) (466/2012).

SAMPLING

The sample size was calculated with the G-Power program using the Chi-square test, considering a power of 85%, alpha of 0.05 and sample loss of 15%. Data from the first 8 participants in each group (no pain, mild pain, moderate pain and severe pain) were considered. For this calculation, the value of VAS at the entrance was considered. Thus, a sample size of 32 participants, 8 per group, was calculated.

INCLUSION CRITERIA

Patients aged 18 years or older were included; of both genders; able to communicate; admitted to the aforementioned unit for orthopedic surgical treatment involving bone, muscle, ligament or tendon injuries, due to some trauma mechanism; submitted to any type of anesthesia; with immediate PO in the ward or ICU and who signed the Free and Informed Consent Term (TCLE), in accordance with CNS resolution 466/12.

EXCLUSION CRITERIA

Patients with cognitive impairment (acute or chronic); who presented with a Glasgow Coma Scale (GCS) lower than 15 in the post-anesthesia care unit (PACU) due to residual sedation or who refused to participate in the research.

EXECUTION

Initially, the research team received a daily updated list from the Internal Regulation Nucleus team (NIR) of patients admitted to the unit, either in the ward or in the ICU. Afterwards, the researchers selected the patients who were candidates to participate in the research, based on the inclusion/exclusion criteria.

PREOPERATIVE EVALUATION

The interviewer looked for the patient in his hospital bed, on the day of his admission, for the initial presentation of the work. The patient who accepted to participate in the research and signed the informed consent was submitted to a preoperative form applied by the interviewer. This moment occurred between 06:00h and 18:00h, as patients admitted at night, from 18:00h, were interviewed from 06:00h of the following day. At that moment, anamnesis was performed and personal data, sociodemographic information, medical history and preoperative expectations were collected. Patients were asked about the presence of pain and emotional conditions.

INTRAOPERATIVE EVALUATION

During the surgical procedure, necessary information was obtained to complete the supplementary form through the electronic medical record, such as pain assessment at the entrance to the operating room (OR), surgical time (in minutes), surgery performed, surgical size, type of anesthesia performed and drugs used intraoperatively.

POSTOPERATIVE EVALUATION

In the PO, the same pain assessment was performed at PACU admission and discharge, as well as 24 hours after PACU discharge, the latter being used to categorize patients into 4 groups (no pain, mild pain, moderate pain and severe pain) .

PAIN ASSESSMENT

Pain assessment was performed before (admission and arrival at the OR) and postoperatively (arrival at the PACU, discharge from the PACU and 24 hours after discharge from the PACU), using the VAS. The VAS is an instrument that consists of a 10-centimeter long straight line, the left end being "absence of pain" and the right end being "the greatest possible intensity of pain".

The patient was asked to place the finger on the cursor, between the two extremes, indicating the point corresponding to the pain at that moment. Subsequently, the intensity of the result was classified into: group without pain (GWP) (VAS=0), group with mild pain (GMP) (VAS 1-3), group with moderate pain (VAS 4-6) and group with severe pain. (GSP) (VAS ≥ 7) 13. The scale is a validated instrument, in addition to being the measurement standardized by the institution, facilitating its application.

There was no interference from the investigators regarding the signaling of pain to the assistant team, nor about procedures aimed at patients' analgesia.

ASSESSMENT OF EMOTIONAL CONDITIONS

After the initial data collection, the interviewer instructed the participants on the questionnaire for the assessment of anxiety, the Beck Anxiety Inventory (BAI). Proposed by Beck et al. in 1988, the questionnaire proved to be useful in measuring the level of anxiety, without overlapping symptoms of depression confounding the assessment [14]. It is a 21-item scale that describes common symptoms of anxiety.

The patient responded by rating how much each symptom bothered him in the last week on a scale ranging from 0 (Absolutely not) to 3 (Severely – Difficult to bear). The sum of individual scores ranges from 0 to 63. Anxiety severity was defined in four stages: minimal (from 0 to 10), mild (from 11 to 19), moderate (from 20 to 30) and severe (from 31 a 63) [14]. The BAI is an instrument validated in the Portuguese version 15, easy to apply because it consists of simple and brief questions, focusing on somatic symptoms of anxiety in the short term [16].

Analyzes were performed in absolute values and severity categories. Patients who already had a diagnosis of anxiety and/or were under anxiolytic drug treatment were not evaluated by the BAI questionnaire.

OPIOID CONSUMPTION

The standardization of the equivalent of milligrams of morphine (MME) was used to compare the treatment with opioids in the different surgical procedures. This value represents the estimated equianalgesic dose of the different opioids and is useful for monitoring those most at risk for abuse and overdose.

For the calculation, the daily dose of a given opioid is multiplied by the conversion rate to determine the MME in milligrams per day (mg/day). An MME less than 20 mg/day has a 1.44 lower risk of overdose than an MME between 20-49 mg/day, 3.73 lower than an MME between 50 and 99 mg/day, and 8.87 less than an MME greater than 100 mg/day [17]. Based on recent literature, the following conversion values were used: intravenous morphine (x3), intravenous fentanyl (x300), oral codeine (x0.15) and intravenous tramadol oral (x0.1)[18].

STATISTICAL ANALYSIS

The Statistical Package for the Social Sciences (SPSS) version 20 for Windows was used for data analysis. Data normality was verified using the Kolmogorov-Smirnov test and parametric variables were expressed as mean ± standard deviation and non-parametric variables as median (interquartile range 25-75%), as well as nominal variables were expressed as frequency (percentage).

To compare the groups with and without APOP, the One-Way Anova test was used for parametric variables and its non-parametric equivalent, the Kruskal-Wallis test. For associations of categorical variables, the chi-square test was used, with Cramer's V being used for variables with more than two response categories. A significance level of 5% was adopted.

The association between APOP and the other variables was established using the Pearson or Spearman correlation coefficient for parametric and non-parametric data, respectively, and the correlation coefficients were classified as a weak correlation (r between 0.2 and 0.39) ; moderate (r between 0.4 and 0.69) and strong (r between 0.7 and 0.89) [19].

To compare the categories of groups that performed or not peripheral blocks in lower limb surgeries, Student's t test was used for parametric variables and its nonparametric equivalent Mann-Withney test. To compare the categorical variables, the chi-square test was used. A significance level lower than or equal to 5% was adopted.

ETHICAL ASPECTS

The study was approved by the Research Ethics Committee (CEP) of the Centro Universitário de Brasília (UNICEUB) CAAE: 53142221.3.0000.0023 and the participating institution, in accordance with resolution 466/12 CNS. Data collection was performed only after this approval.

The patients or their respective guardians signed the consent form for authorization as a participant in this research, which was signed after receiving all the information related to the phases and procedures of this project, and its objectives, in addition to possible ways of disclosing the results and confidentiality.

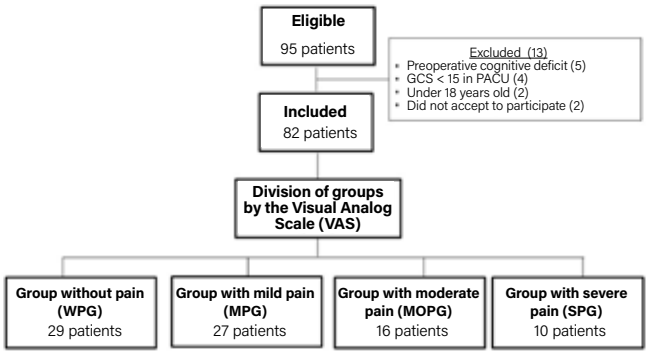
They were clarified about the possible benefits and risks and ways of repairing these, such as the possibility of compensation, if they cause harm to the patient and reimbursement of expenses that the participant, perhaps, would have with the research.

All information was given as clearly and simply as possible for them to decide whether or not to participate in the study. They did not receive any remuneration or bonus for this and were free to withdraw their consent to continue the research at any time and at any stage of the research, without penalty or any detriment to their assistance.

The data were confidential and the names of the patients were kept confidential during all stages of the study, with an explicit commitment that they would not be identified.

RESULTS

Of the hospitalized patients, 95 were eligible for the study, but 13 were excluded, totaling 82 patients (Figure 1). The 82 patients were divided according to the VAS score after 24 hours postoperatively into groups without APOP (WPG=29), with mild APOP (MPG=27), moderate APOP (MOPG=16) and severe APOP (SPG=10). Most of the population studied (53.6%) had incomplete elementary education, followed by 15.8% who were illiterate. Schooling was not a significant factor in predicting the development of APOP.



Caio Barros - Figure 1. Study flowchart

The mean age between the groups was 59.7 years, and the group with severe pain had the lowest median (46 years) (p = 0.09). No significant differences were observed for sociodemographic variables (Table 1).

Regarding preoperative data, no significant differences were observed between the groups for the admission interval (p=0.07), surgeries (p=0.72) and previous pain (0.54) and trauma mechanism (p=0.72). =0.75). However, patients in the pain-free group had the lowest median interval of days between the trauma and the surgical procedure (3 days), while the group with severe pain had the longest interval, with a median of 6 days (p=0.07).

Variável (n=82)	GSD (n=29)	GDL (n=27)	GDM (n=16)	GDF (n=10)	p valor
Sexo					
Feminino	15 (51,7)	20 (74,1)	9 (56,2)	5 (50)	0,31
Masculino	14 (48,3)	7 (25,9)	7 (43,8)	5 (50)	
Idade (anos)	59 (43,5-68)	64,5 (53,2-77)	69,5 (46,2-79,2)	46 (30-72)	0,09
IMC (kg/m²)	24,3±4,6	26,1±3,9	24,8±4,5	24,9±6	0,46
Escolaridade					
Analfabeto	2 (6,9)	8 (29,6)	3 (19)	0	0,47
Ensino Fundamental incompleto	18 (62,1)	12 (44,4)	9 (57,1)	5 (80)	
Ensino Fundamental completo	5 (17,3)	3 (11,1)	2 (9,5)	2 (20)	
Ensino Médio incompleto	2 (6,9)	3 (11,1)	0	2 (20)	
Ensino Médio completo	1 (3,4)	1 (3,8)	2 (4,8)	1 (10)	
Ensino Superior ou Pós graduação	1 (3,4)	0	0	0	
Religião					
Católico	20 (69)	15 (55,6)	13 (81,3)	3 (30)	0,20
Espírita	1 (3,4)	1 (3,7)	0	1 (10)	
Evangélico	8 (27,6)	11 (40,7)	3 (18,7)	6 (60)	

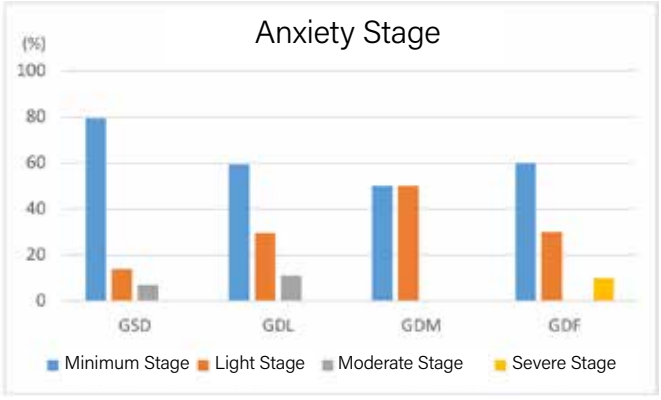
Dados apresentados em média±desvio padrão; frequência (porcentagem); mediana (intervalo interquartílico (25-75%)).

Caio Barros - Table 1. Sociodemographic Data

No differences were observed for the sensation of pain that the patient would possibly feel in the PO, as well as for the score on the anxiety scale. (Table 2).

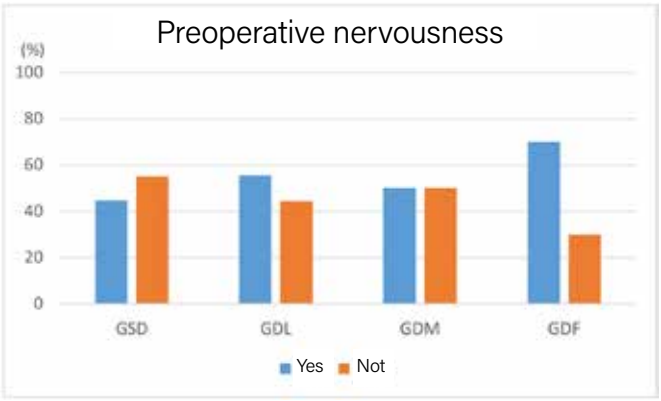
Most patients (59.7%) were hospitalized due to a fall from their own height, 24.3% due to a car accident, 10.9% due to a fall from a level and 4.8% due to a work accident or violent cause.

Regarding emotional conditions in the preoperative period, there was no statistical difference for the score on the BAI anxiety scale and most patients were in the minimum stage (p=0.16) (Figure 2).



Caio Barros - Figure 2. Classification of preoperative anxiety in the 4 groups

The pain-free group had a higher percentage of patients who were not nervous/anxious, while in the severe pain group, most patients (70%) reported being nervous/anxious before surgery, with no significant difference between them (p=0.56) (Figure 3).



Caio Barros - Figure 3. Self-report of preoperative nervousness/anxiety in the 4 groups

Regarding the intraoperative findings, it was observed that the WPG had a significantly lower number (p=0.05) of patients with pain at the entrance to the OR when compared to the MPG, MOPG and SPG. There was a progressive increase between the groups, with 90% of the patients in the SPG presenting with preoperative pain. However, none of the patients in this group received analgesia. In addition, higher scores on the VAS at entry were observed for the groups with moderate pain and severe pain, with a difference between the groups (p=0.02). After performing the Kruskal-Wallis test, it was evidenced that this difference occurred specifically between the WPG and the groups with mild pain (p=0.03), moderate pain (p=0.01) and severe pain (p=0. 03).

Variável (n=82)	GSD (n=29)	GDL (n=27)	GDM (n=16)	GDF (n=10)	p valor
Intervalo trauma-cirurgia (dias)	3 (0-9)	5 (4-7)	4 (3-5)	6 (3,75-17,5)	0,07
Cirurgias prévias					
Sim	24 (82,8)	20 (74,1)	11 (68,7)	8 (80)	
Não	5 (17,2)	7 (25,9)	5 (31,3)	2 (20)	0,72
Dor prévia ao trauma					
Sim	11 (37,9)	13 (48,1)	10 (62,5)	4 (40)	0,54
Não	18 (62,1)	14 (51,9)	6 (37,5)	6 (60)	
Mecanismo de trauma					
Queda da própria altura	16 (55,2)	18 (66,7)	10 (62,5)	5 (50)	0,75
Queda de nível	3 (10,3)	3 (11,1)	2 (12,5)	1 (10)	
Acidente automobilístico	8 (27,6)	5 (18,5)	4 (25)	3 (30)	
Violência	0	1 (3,7)	0	1 (10)	
Acidente de trabalho	2 (6,9)	0	0	0	
Sentirá dor					
Sim	14 (48,3)	17 (63)	10 (62,5)	5 (50)	0,42
Não	15 (51,7)	10 (37)	6 (37,5)	5 (50)	
BAI (categoria)					
Estágio Mínimo	23 (79,3)	16 (59,3)	12 (75)	6 (60)	
Estágio Leve	4 (13,8)	8 (29,6)	4 (25)	3 (30)	0,16
Estágio Moderado	2 (6,9)	3 (11,1)	0	0	
Estágio Grave	0	0	0	1 (10)	
Nervosismo					
Sim	13 (44,8)	15 (55,6)	8 (50)	7 (70)	0,56
Não	16 (55,2)	12 (44,4)	8 (50)	3 (30)	

Legenda: BAI: Inventário de Ansiedade de Beck (Beck Anxiety Inventory – BAI). Dados apresentados em frequência (porcentagem) e medias (intervalo interquartílico (25-75%)).

Caio Barros - Table 2. Preoperative data

Regarding the surgical size, most patients in the pain groups (MPG, MOPG and SPG) underwent medium-sized surgeries, while the pain-free group mostly performed small surgeries (p=0.16). The patients' surgical time was longer in the MOPG and SPG (p=0.22) (Table 3).

After surgery, a significant difference was observed between the groups for pain (p<0.01) and 24-hour VAS (p>0.01), which was expected since the groups were divided according to the latter variable.

Variável (n=82)	GSD (n=29)	GDL (n=27)	GDM (n=16)	GDF (n=10)	p valor
Dor na entrada do CC					0,05*
Sim	14 (48,3)	22 (81,5)	14 (87,5)	9 (90)	
Não	15 (51,7)	5 (18,5)	2 (12,5)	1 (10)	
EVA na entrada do CC	0 (0-4,5)	3 (1-5)	4,5 (2-8)	5 (2,5-5,7)	0,02**
Analgesia na entrada do CC					
Sim	6 (20,7)	3 (11,1)	5 (31,2)	0	0,15
Não	23 (79,3)	24 (88,9)	11 (68,8)	10 (100)	
Porte cirúrgico					
Pequeno	17 (58,6)	11 (40,7)	5 (31,3)	3 (30)	0,16
Médio	9 (31)	15 (55,6)	8 (50)	7 (70)	
Grande	3 (10,6)	1 (3,7)	3 (18,7)	0	
Sedação					
Sim	29 (100)	25 (92,6)	16 (100)	9 (90)	0,27
Não	0	2 (7,4)	0	1 (10)	
Anestesia Geral Balanceada	1 (3,4)	2 (7,4)	0	1 (10)	0,6
Bloqueio Neuroeixo					
Sim	12 (41,4)	9 (33,3)	8 (50)	6 (60)	0,46
Não	17 (58,6)	18 (66,7)	8 (50)	4 (40)	
Bloqueio Periférico					
Sim	19 (65,5)	18 (66,7)	8 (50)	5 (50)	0,59
Não	10 (34,5)	9 (33,3)	8 (50)	5 (50)	
Tempo cirúrgico (minutos)	60 (60-100)	90 (60-120)	110 (63,7-146,2)	100 (75-135)	0,22

egenda: EVA: escala visual analógica. Dados apresentados em frequência (porcentagem) e mediana (intervalo interquartílico (25-75%)). * p≤ 0.0 este Qui-quadrado **p≤ 0.05 Teste de Kruskal-Wallis

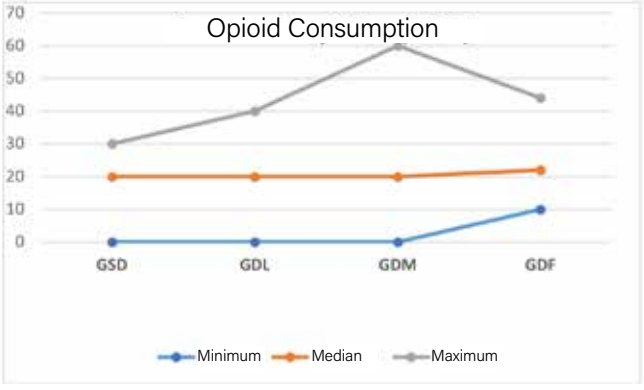
Caio Barros - Table 3. Intraoperative data

In relation to MME, no statistically significant differences were observed (p=0.36) (Table 4). However, it can be observed that only in the GSP group were not found patients who did not consume opioids. Likewise, the highest MME values were found in the GSP. (Figure 4).

Variável (n=82)	GSD (n=29)	GDL (n=27)	GDM (n=16)	GDF (n=10)	p valor
Dor na entrada da SRPA					0,23
Sim	0	3 (11,1)	1 (6,2)	0	
Não	29 (100)	24 (89,9)	15 (93,8)	10 (100)	
EVA na entrada da SRPA	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0,24
Analgesia na entrada da SRPA					
Sim	0	0	0	0	0,70
Não	29 (100)	27 (100)	16 (100)	10 (100)	
Dor na alta da SRPA					
Sim	0	3 (11,1)	1 (6,2)	0	0,23
Não	29 (100)	24 (88,9)	15 (93,8)	10 (100)	
EVA na alta da SRPA	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0,23
Analgesia na alta da SRPA					
Sim	0	1 (3,7)	0	0	0,56
Não	29 (100)	26 (96,3)	16 (100)	10 (100)	
Dor em 24 horas de PO					<0,01**
Sim	0	27 (100)	16 (100)	10 (100)	
Não	29 (100)	0	0	0	
EVA em 24 horas de PO	0 (0-0)	2 (1-3)	5 (4-6)	7,5 (7-9,2)	<0,01*
Analgesia em 24 horas de PO					0,81
Sim	28 (96,6)	26 (96,3)	16 (100)	10 (100)	
Não	1 (3,4)	1 (3,7)	0	0	
Local de internação no PO					
Enfermaria	22 (75,9)	21 (77,8)	11 (68,8)	6 (60)	0,70
UTI	7 (24,1)	6 (22,2)	5 (11,2)	4 (40)	
MME 24 horas	20 (0-30)	20 (4,5-20)	20 (10-30)	22 (10-25,5)	0,36

genda: SRPA: sala de recuperação pós-anestésica; EVA: escala visual analógica; EMM: equivalentes de miligrama de morfina. Dados apresen
- frequência (porcentagem) e mediana (intervalo interquartílico (25-75%)). * p≤ 0.05 Teste Chi-quadrado **p≤ 0.05 Teste de Kruskal-Wallis

Caio Barros - Table 4. Postoperative data



Caio Barros - Figure 4. Opioid consumption in the 4 groups

DISCUSSION

SOCIODEMOGRAPHIC PROFILE

The SPG had the lowest median age (46 years) among the 4 groups. The literature shows in recent articles that age is a risk factor for APOP. A meta-analysis on APOP identified that younger patients have a 1.18-fold greater risk of having poor pain control in PO [11]. Schnabel et al. showed that patients younger than 54 years of age had a 1.27-fold greater risk of experiencing severe pain in the postoperative period [20]. In line with previous studies, a recent multicentric retrospective cohort with 11,510 patients showed a reduction of 0.2 points in the VAS for each increase of one decade of life [21].

In the population studied, the age difference between the groups with pain approached statistical significance, despite not having reached it. A larger number of patients may be needed to reach significance. But such data are similar to recent literature, indicating that age is a significant risk factor for APOP, despite this difference in reported pain being very small, and perhaps not clinically relevant.

Patients with a low educational level (incomplete elementary school or illiterate) corresponded to 69.4% of the sample. A cohort of 344 elderly people with hip fracture identified 40.1% of patients with less than 8 years of schooling. Low education was an independent risk factor for severe APOP [22]. In an orthopedic emergency scenario, patients have less time to acquire preoperative information and prepare to face this moment. Those with shorter study time have an increased risk of developing more intense APOP. However, in the present study, there was no statistical difference between this factor and pain intensity at 24h PO (p=0.47).

POST-OPERATIVE ACUTE PAIN

In the present study, it was observed that 26 patients (31.7%) had moderate or severe pain within 24 hours of PO, being 12% of the SPG.

Van Boekel et al. investigated the incidence of APOP in different surgeries in 1579 patients and found that 55% of them had pain 24 hours after the surgical procedure with VAS scores between 4 and 10. Of these, 15% reported a VAS between 8 and 10, resulting in 8.25% of the entire sample studied [23].

It is known that orthopedic surgeries are among the most painful surgical procedures. A large prospective cohort comparing the intensity of pain on the first PO day in different surgeries reported that among the 40 surgeries with the greatest pain stimulus, 22 were orthopedic/traumatic [4].

A cohort in an orthopedic trauma center with patients undergoing surgical correction showed that 56% presented with severe PACU pain [9].

Another multicentric prospective cohort aimed to analyze risk factors associated with APOP after emergency orthopedic surgeries. It was found that 29% of patients had moderate to severe APOP within 24 hours of PO [10].

Liu et al. reported that 40% of patients undergoing gastrointestinal surgery had moderate or severe acute pain on PO [24]. This same study showed that the preoperative expectation of feeling pain after surgery was associated with APOP, with statistical significance (p< 0.001).

The percentage of patients who had moderate to severe APOP in this research is equivalent to what is described in the literature in similar articles. However, it is important to emphasize that some studies use different pain measurement scales, which can make such comparisons difficult. In addition, there are few recent studies that have investigated APOP in the orthopedic trauma population.

PRE-OPERATIVE ANXIETY

This research did not show significant differences in the influence of preoperative anxiety on APOP (p=0.16). However, it is described in recent literature that patients who were previously anxious about surgery develop more intense acute pain in the PO. Yang et al showed in a meta-analysis of risk predictors for APOP, without defining which type of surgery, that patients with a history of anxiety symptoms (by self-report or moderate to severe scores on the Hamilton Scale, State Anxiety Inventory or Numerical Scale for Anxiety) had a 1.22-fold greater risk of experiencing more severe pain within 24 hours of PO [11].

A prospective multicenter study evaluated 200 orthopedic trauma patients who underwent a corrective surgical procedure. It was identified that those who had preoperative anxiety had a 6.42-fold risk of developing moderate to severe APOP (95% CI: 2.59-15.90) [10]. In a group of patients undergoing gastrointestinal surgery, the Anxious state prior to surgery was also an independent risk predictor for APOP (p<0.001) [24].

Lemos et al. assessed the level of anxiety before the surgical procedure using the BAI inventory in 72 women scheduled for surgical treatment of endometrial cancer. Half of the population received preoperative information about their treatment and the other half did not. The first group had a greater number of patients with minimal or mild classification compared to the group that did not receive information [16].

One result of this study that drew attention was that when asked if patients felt nervous/anxious about the surgery, in the WPG less than half (44.8%) answered yes, while in the SPG 70% said they were nervous (Figure 3).

The reason that this factor did not present a statistical difference can be explained by the non-inclusion of patients with a previous diagnosis of anxiety. Studies that analyzed preoperative anxiety did not report such a distinction.

It is noticed that the psychological and emotional state of patients who will undergo surgery is a relevant factor for their pain experience in the PO. In the context of traumatic and urgent injuries, the level of stress and anxiety become even greater. Therefore, the sooner a preoperative evaluation is carried out, presenting the patient with the therapeutic plan, understanding their expectations and desires and bringing realistic goals, the better the control of APOP will be.

TRAUMA-SURGERY INTERVAL

The time elapsed between the trauma and the surgery showed a difference between the groups with and without pain, approaching statistical significance. WPG had a median of 3 days, while SPG had a median of 6 days (p=0.07).

A prospective cohort of patients undergoing hip fracture surgery demonstrated an interval between hospital admission and surgery of 7.4 days, with no significant association with APOP (p=0.9) [22].

Dutch study researched factors associated with APOP in a university hospital for 6 years. Among them, the interval between admission to the institution and the day of surgery was a risk predictor for moderate and severe pain in the first 3 postoperative days, being significantly higher in the first 24 hours [23].

The mean number of days between hospital arrival and surgery was shorter than described in other articles. However, there is a scarcity of studies that cite this time interval as a risk factor for APOP, especially Brazilian studies. Delay in the surgical procedure may be associated with longer pain time until surgical correction, sensitizing the nociceptive pathways and contributing to the development of acute and chronic postoperative pain. In addition, waiting for surgery can increase the level of anxiety and psychological stress.

Although not statistically significant, the result approached relevance. Surgical planning should be optimized in order to reduce the interval between trauma and surgery to avoid risks such as thromboembolic phenomena and longer pain stimulus time before correction. In those patients in whom surgery is expected to be delayed (use of anticoagulants, active infections, among other factors that require a postponement of the procedure), it is imperative to mobilize the assistant team to optimize pain control.

PREOPERATIVE PAIN INTENSITY

Higher VAS scores in the preoperative period showed a significant correlation with the development of moderate and severe pain at 24 hours postoperatively (p=0.02).

Yang et al. showed through a meta-analysis that the presence of preoperative pain was significantly associated with poor postoperative pain control [11].

A multicentric cohort of 200 patients undergoing emergency orthopedic surgery showed that patients with pain prior to surgery had a 7.92-fold greater risk of having moderate or severe pain in the PO, compared with those who had no pain before surgery [10].

In a study that evaluated the presence of APOP in the PACU and persistent pain after orthopedic trauma, the presence of higher scores on the VAS before surgery was not associated with the intensity of acute pain in the PACU. However, this same factor was statistically significant for

persistent pain at 3 months after surgery (p=0.02) [9].

The presence of preoperative pain seems to be one of the main risk predictors for APOP. This work showed similar results to most studies using the same patient profile. It was evident that patients with poorly treated pain while waiting for surgery have a higher risk of having APOP and the pain intensity is directly proportional in the pre and postoperative periods.

Once again, it is clear that a risk stratification at hospital admission is essential to guide the appropriate pain management for each patient. Those who wait longer for surgery and still have high scores on pain scales will undergo a more intense and prolonged process of neuronal sensitization at the central and peripheral levels, significantly influencing their recovery and rehabilitation process. Designating a responsible team to act at this stage, including an anesthesiologist, is highly recommended.

SURGICAL TIME

Surgical time was not statistically relevant for APOP (p=0.22). But it is observed that MOPG and SPG patients had longer surgeries (with medians of 110 and 100 minutes, respectively) than the groups with mild pain and without pain.

A prospective cohort carried out in Serbia with patients undergoing hip surgery for fracture showed a mean surgical time of 92.5 minutes, with no statistical significance for association with APOP (p=0.7) [22].

In an observational study in patients undergoing surgery for breast cancer, the surgical time was longer in patients with moderate and severe APOP, averaging 111 and 136 minutes, respectively (p<0.01) [25].

Longer duration of surgery and anesthesia was also associated with greater intensity of acute PO pain in a multicenter study with emergency orthopedic surgery (p=0.6) [10].

Surgery time proved to be a factor with conflicting results in the literature, not being one of the main risk predictors for APOP. Studies evaluating different types of surgery make comparisons difficult, since each procedure has its complexity and requires a different time. Compared with similar populations of orthopedic trauma in other studies, this research brought concordant results. Considering that the present study analyzed such factors in patients undergoing orthopedic surgeries of the upper and lower limbs, it is important to highlight that performing an analysis for each specific procedure would be a way to highlight the real interference of surgery time in the development of APOP. However, a larger sample is needed to perform this comparison.

This study has as limitations the fact that it was carried out in a single center. Therefore, caution should be exercised when expanding the results found in this research to other centers. Despite the number of patients analyzed having exceeded the sample size calculation, it is believed that a larger sample of subjects could bring more results with statistical relevance.

The exclusion of patients with previously diagnosed anxiety and/or who were using anxiolytic drugs may have affected the analysis in relation to preoperative anxiety. It is questioned whether the inclusion of these patients will interfere in the comparison with the intensity of APOP.

It was not possible to compare the intensity of pain in the 24 hours postoperatively between the groups that performed peripheral block or not, which is a highly relevant factor for the outcome studied.

CONCLUSION

APOP has a complex and multifactorial pathophysiology. It is necessary to know its multiple activation pathways in order to block pain signaling with different mechanisms of action.

Several factors were found to be associated with the development of severe PO pain. Some of them can be modified during hospital stay if recognized early.

In this study, it was concluded that patients with more severe pain in the preoperative period had a higher incidence of moderate and severe APOP with statistical significance. Early identification and targeted action to combat pain will have a positive influence on APOP, optimizing postoperative recovery.

Based on the aforementioned evidence, it is necessary to create a team responsible for the treatment of acute pain for the development of an admission screening based on previously selected risk predictors, well-defined therapeutic protocols, continuing education policies with patients and professionals. assistants and evaluation criteria of the actions practiced.

The anesthesiologist plays a fundamental role in this team due to his knowledge about pain management, in addition to being able to be present in the three phases of the patient's hospital journey: pre, intra and postoperative, ensuring a more consolidated bond with the patient and a global view of his recovery.

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