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PSYCHOLOGICAL IMPACT OF POST-OPERATIVE ENDODONTIC PAIN

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Abstract

Post-operative pain is defined as the onset or worsening of a painful symptomatology related to the therapeutic procedure and/or the pathological condition that justified the procedure. Various types of post-endodontic pain have been observed, ranging from inflammatory to chronic. The aim of the present study was to determine the extent of the psychological impact of post-endodontic pain.

The study was carried out in the city of Majunga, at the Centre de Soins et de Traitements Dentaires of the Institut Odonto-Stomatologie Tropicale Madagascar. It was a prospective, descriptive, cross-sectional study conducted from March to June 2023.Fifty patients aged 18 and over with post-endodontic pain were recruited to the study.A questionnaire in the form of an interview was carried out to collect the data, which were entered, processed and analyzed on computer using SPSS 20.0 software.

The results highlighted that the characteristics of postoperative pain in endodontics vary according to type, intensity, onset and even evolution. Pain has a psychological impact on the patient's life, causing apprehension about pain (92%), fear of dentists (6%) and dental anxiety (12%).

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The management of post-operative pain and its impact on patient psychology should not be underestimated.

Thus, an analytical study with representative samples would be desirable to fully understand this pathology, which presents a real public health problem.

Key words: Inflammatory flare-up, Endodontic treatment, Postoperative pain, Psychology

Introduction

Postoperative pain is defined as the onset or worsening of a painful symptomatology related to the therapeutic procedure and/or the pathological condition that justified the procedure.

It may be of immediate or delayed onset, and may be transient, prolonged or permanent. On the basis of its temporal definition, we can speak of postoperative inflammatory pain when it lasts less than 7 days, and of chronic pain when it lasts more than 3 months. [1]

Varying in intensity from patient to another, its clinical features are very often similar to those of acute apical periodontitis: they translate into continuous pain, exacerbated by occlusal percussion or periapical palpation and is often well localized by the patient. [2]

In 2011, the results of a systematic review and meta-analysis by Pak and*al* showed that the prevalence of post-operative pain averaged 40% 24 hours after treatment and 11% at 7 days [1].

In 2013, a prospective clinical study based on 374 root canal treatments reported a high incidence of pain of 47,3%, of which 69,5% occurred during the first two post-operative days [3].

The experience of pain is likely to leave a negative memory that can engender fear. This fear, experienced during treatment, encourages a hyperfocusing of attention on the treated area, and can amplify the painful experience. Thus, pain can generate anxiety, but anxiety can also amplify, or even generate, pain, hence the psychological impact on a patient [4] [6].

Following a survey, Larrea L et al asserted that fear of pain is one of the main barriers to access to care, and thus contributes to the poor oral and dental health of part of the population: 4

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to 20% of French people suffer from dental anxiety, including 6% for whom the phobia represents a total obstacle to care. [6]

As a result, postoperative pain in endodontics may have a negative impact on treatment, by reducing patient compliance and confidence in the odontostomatologist; it also affects daily life, sleep quality and quality of life, and may reduce the patient's ability to work.

It can also have psychological repercussions, including a permanent focus on pain. [7]

In Madagascar, few studies of post-operative pain in endodontics have been conducted. To contribute to this, this study was carried out on Malagasy patients to answer the following research question: does post-endodontic treatment pain have psychological effects on the patient?

The aims of the study were to identify the characteristics of post-operative pain in endodontics, and to determine the extent of the psychological impact of post-operative pain in endodontics.

Materials and Methods

This was a prospective, descriptive, cross-sectional study conducted over a three-month period from March 2023 to June 2023 at the Dental Care and Treatment Center (CSTD) of the Institut Odonto-Stomatologie Tropicale Madagascar (IOSTM) in Majunga. The study population consisted of 50 patients presenting to the CSTD for pain after endodontic treatment or retreatment during this period. Patients aged 18 and over presenting with post-endodontic pain were included in the study.

Mentally handicapped and uncooperative patients were excluded from the study.

The following items and information were recorded:

- Social characteristics (gender, age)
- Tooth types (monoradiculated, pluriradiculated)
- Initial dental pathology (pulpitis, pulpal necrosis, apical periodontitis)
- Types of treatment (initial endodontic treatment, endodontic retreatment)

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- Pain characteristics (location, intensity, description of pain, period of onset, frequency of onset in 24 hours, onset of pain, factors affecting pain, signs associated with pain, course of pain)
- Use of pain-relieving medication
- Psychological impact of pain (apprehension of pain, fear, anxiety)

Evaluation criteria:

-for pain :

- Visual Analogue Scale (VAS)

This is the scale used to define the intensity of the subject's pain.

-for anxiety:

- The "CDAS" scale (Corah Dental AnxietyScale) is used to assess the patient's anxiety about dental treatment [8]

A pre-established, tested and validated anonymous questionnaire has been designed to collect information.

A request for authorization from CSTD's clinical teaching staff was made before the start of the study, and information was collected in the form of individual interviews. Free and informed consent was obtained from the patients interviewed, after the objectives of the study had been clearly explained to them, and confidentiality was respected.

Data were analyzed using SPPSS 20.0 software.Then, the association between the existence of post-endodontic pain and social characteristics, pain characteristics and the psychological impact of pain was carried out using the Chi-square test. The results were considered significant at $p<0.05$ if the test conditions were respected.

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Results

Table I: Social characteristics of the sample

Social characteristics		Effective (n)	Proportion (%)
Gender			
	Male	21	42
	Feminine	29	58
	Total	50	100
Age (in years)			
	18 to 24	19	38
	25 to 34	11	22
	35 to 44	11	22
	45 to 54	5	10
	≥ 55	4	8
	Total	50	100

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Table I: Distribution of the sample according to the history of the treated tooth

Treated tooth		Effective (n)	Proportion (%)
Type of treatment			
	Initial endodontic treatment	32	64.0
	Endodontic retreatment	18	36.0
	Total	50	100
Type of tooth			
	Monorooted	20	40.0
	Multirooted	30	60.0
	Total	50	100
Initial dental pathology			
	Pulpitis	24	48.0
	Necrosis	11	22.0
	Apical periodontitis	15	30.0
	Total	50	100

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Table II: Distribution of the sample according to the characteristics of post-endodontic pain

Pain characteristics		Effective (n)	Proportion (%)
Location			
	Localized	33	66.0
	Diffuse	17	34.0
	Total	50	100
Intensity			
	2 to 4 (light)	10	20.0
	5 to 7 (moderate)	26	52.0
	8 to 10 (severe)	14	28.0
	Total	50	100
Frequency of pain occurrence			
	Between 1 and 5 times	35	70.0
	Between 6 and 10 times	14	28.0
	11 times and more	1	2.0
	Total	50	100

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Pain characteristics		Effective (n)	Proportion (%)
Types of pain			
	Shock	06	3.92
	compression	14	9.15
	Stab	05	3.26
	Pain caused	14	9.15
	Painful cold feeling	06	3.92
	Sharp pain	10	6.53
	Shooting pain	06	3.92
	Radiating pain	25	16.33
	Throbbing pain	27	17.64
	Persistent pain	36	23.52
	Sensitivity at the gum	04	2.61
	Total	153	100

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Pain characteristic		Effective (n)	Proportion (%)
Period of Onset of Pain			
	Immediately after treatment	10	20.0
	Later in the day	2	4.0
	The day after	19	38.0
	48 hours after treatment	10	20.0
	More than 2 days	9	18.0
	Total	50	100

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Pain characteristic		Effective (n)	Proportion (%)
Evolution of pain			
	gradually diminished	23	46.0
	Very weak now	6	12.0
	accentuated daily	7	14.0
	completely disappeared	7	14.0
	Variable and episodic	4	8.0
	don't remember anymore	3	6.0
	Total	50	100

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Table III: Distribution of the sample according to the possibility of taking medication

Medicines		Effective (n)	Proportion (%)
Taking medication			
	Yes	33	66.0
	No	17	34.0
	Total	50	100
Type of medications			
	Analgesic	17	34.0
	Analgesic + antibiotic	9	18.0
	Analgesic + NSAIDs	1	2.0
	Analgesic + ATB + NSAIDs	1	2.0
	Antibiotic	5	10.0
	None	17	34.0
	Total	50	100

ATB: antibiotic

NSAID: Non-steroidal anti-inflammatory

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Table V: Distribution of the sample according to the psychological impact of post-endodontic pain

Psychological impact	Effective (n)	Proportion (%)
Pain apprehension		
Yes	46	92
No	4	8
Fear of dentists		
Yes	3	6
No	47	94
Anxiety		
Yes	6	12
No	44	88
Total	50	100

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Table VI: Distribution of the sample according to social characteristics and apprehension of pain

Social characteristics	**Apprehension of pain**					
	Yes		**No**		**Total**	
	(n)	**(%)**	**(n)**	**(%)**	**(n)**	**(%)**
Gender						
Male	14	66,7	7	33,3	21	100
Féminine	25	86,2	4	13,8	29	100
Total	39	78,0	11	22,0	50	100
Age (in years)						
18 to 24	16	84,2	3	15,8	19	100
25 to 34	8	72,7	3	27,3	11	100
35 to 44	8	72,7	3	27,3	11	100
45 to 54	4	80,0	1	20,0	5	100
≥ 55	3	75,0	1	25,0	4	100
Total	39	78,0	11	22,0	50	100

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Table VII: Distribution of the sample according to pain intensity and pain apprehension

Pain intensity	**Pain apprehension**					
	Yes		**No**		**Total**	
	(n)	**(%)**	**(n)**	**(%)**	**(n)**	**(%)**
Intensity						
2 – 4 (light)	9	90.0	1	10.0	10	100
5 – 7 (moderate)	19	73.07	7	26.93	26	100
8 -10 (severe)	11	78.6	3	21.4	14	100
Total	39	78.0	11	22.0	50	100

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Table VIII: Distribution of the sample according to social characteristics and fear of dentists

Social characteristics	**Fear of dentists**					
	Yes		**No**		**Total**	
	(n)	**(%)**	**(n)**	**(%)**	**(n)**	**(%)**
Gender						
Male	5	23,8	16	76,2	21	100
Feminine	3	10,3	26	89,7	29	100
Total	8	16,0	42	84,0	50	100
Age (in years)						
18 to 24	1	5,3	18	94,7	19	100
25 to 34	5	45,5	6	54,5	11	100
35 to 44	1	9,1	10	90,9	11	100
45 to 54	0	00,0	5	100,0	5	100
≥ 55	1	25,0	3	75,0	4	100
Total	8	16,0	42	84,0	50	100

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Table IX: Distribution of the sample according to pain intensity and fear of dentists

Pain intensity	**Fear of dentists**					
	Yes		**No**		**Total**	
	(n)	**(%)**	**(n)**	**(%)**	**(n)**	**(%)**
Intensity						
2 - 4 (light)	2	20.0	8	80.0	10	100
5 - 7 (moderate)	5	19.24	21	80.76	26	100
8 – 10 (severe)	1	7.15	13	92.85	14	100
Total	8	16.0	42	84.0	50	100

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Table X: Distribution of the sample according to social characteristics and dental anxiety

Social characteristics	**Dental anxiety**					
	Yes		**No**		**Total**	
	(n)	**(%)**	**(n)**	**(%)**	**(n)**	**(%)**
Gender						
Male	4	19,0	17	81,0	21	100
Feminine	5	17,2	24	82,8	29	100
Total	9	18,0	41	82,0	50	100
Age (in years)						
18 to 24	3	15,8	16	84,2	19	100
25 to 34	2	18,2	9	81,8	11	100
35 to 44	1	9,1	10	90,9	11	100
45 to 54	3	60,0	2	40,0	5	100
≥ 55	0	00,0	4	100,0	4	100
Total	8	16,0	42	82,0	50	100

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Table XI: Distribution of the sample according to pain intensity and dental anxiety

Pain intensity	**Dental anxiety**					
	Yes		**No**		**Total**	
	(n) (%)		**(n) (%)**		**(n) (%)**	
Intensity						
2 – 4 (light)	0	00.0	10	100.0	10	100
5 – 7 (moderate)	6	23.08	20	76.92	26	100
8 -10 (severe)	3	21.4	11	78.6	14	100
Total	9	18.0	41	82.0	50	100

Discussion

Social characteristics

Among the sample studied, the female gender predominates at 58% with a sex ratio of 0.72 (Table I). According to Akram and*al* in 2016, there is a similarity of results demonstrating the predominance of females in patients with post-endodontic pain. [36] Similarly, some studies have shown a higher prevalence of postoperative pain in women than in men (Walton, 2002). [9]

Several explanations have been put forward:

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- the pain tolerance threshold is higher in men (Gotler and*al*, 2012) [10].

- women suffer more psychosomatic illnesses and their pain is governed by emotional factors (Ng and*al,* 2004)[11].

This could be explained by differences in the physiological response to pain, and by the fact that women present biological particularities that influence pain (hormonal fluctuation, contraceptive treatment) (Gufran and *al*, 2012)[12].

According to age, the 18-24 age group was the most affected, at 38% (Table I).2014 study by Sipaviciute and Manelien corroborates these results, explaining that older patients present less post-operative pain due to the reduced diameter of the root canal, allowing less debris to pass beyond the apex [13].

However, other authors conclude that there would be more pain in the elderly due to a decrease in the volume of the endodontic system, thinning of the dental canal making treatment more difficult and therefore increasing the risk of pain (Arias and*al,* 2013)[14], less blood flow and delayed healing[11].

History of the treated tooth

Regarding the type of treatment (Table II), 64% of teeth treated with initial endodontic therapy showed more post-operative pain, compared with 36% of teeth treated with endodontic retreatment. This result corroborates the study by Gotler et al, who reported significantly higher post-operative pain after initial treatment than after endodontic retreatment [10]. In contrast, other studies found that patients undergoing endodontic retreatment were clearly at greater risk of suffering an inflammatory outbreak[15]. Whether initial treatment or retreatment, the main cause of postoperative pain may be due to incomplete mechanochemical preparation of the apical part of the root canal.

In terms of initial dental pathologies (Table II), the proportion of teeth with pulpitis is high at 48%, followed by apical periodontitis (30%), and pulpal necrosis (22%).The correlation between postoperative pain and pulpal status (vital or necrotic tooth), is complex and still remains controversial where some reports have identified a significant relationship between these two

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factors(Segura-Egea and*al,*2009[16],Gotler and*al.*, 2012)[10], others not (Pasqualini and*al*, 2012)[17]; (Sevekar and Gowda, 2017)[18].

However, one study has shown that teeth with a periapical lesionare considered a risk factor for postoperative pain, and the risk of pain onset is 9.64 times greaterwhen a lesion is present prior to the practitioner's intervention [13].

Depending on the type of tooth (Table II), there is a higher incidence of postoperative pain in pluriradiculate teeth (60%). A similar result was found by Arias et al, who confirmed a higher incidence of postoperative pain in treated molars [3]. This may be explained by the fact that molars have a more complex anatomy and root canal morphology, particularly in the apical third, making complete debridement naturally more difficult, which predisposes to postoperative complications.

Pain characteristics

Various points have been observed to characterize pain (Table III):

As for intensity, since pain is subjective, the pain perception threshold varies from one patient to another, despite the use of objective criteria to materialize it (VAS scale). In this study, the 5 to 7 scale was qualified as moderate pain, accounting for 52% of the sample.

This result is similar to Beach's 2013 study, they found post-endodontic pain of moderate intensity. [19]

The majority of patients indicated that the pain was localized (66%), and as for the type of pain, it was persistent in 23.52% of respondents, pulsatile pain (17.64%), radiating pain (16.33%), the same proportion for provoked pain and compression-type pain (9.15%).

According to the study by Pak JG and White SN, the clinical features of postoperative pain in endodontics are common to descriptions of acute apical periodontitis. It is a continuous, throbbing, well-localized pain, aggravated by occlusal pressure or periapical palpation. [1]

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In this study, many patients began to feel pain the day after the procedure (38%), its frequency was 1 to 5 times in 24 hours (70%), for 46% of them it diminished progressively over the course of the day.There is a similarity of results to other studies, According to Pak JG et al. pain sets in during the hours or days following treatment and diminishes substantially after treatment and especially during the first two days.[1].

The characteristics of pain vary from one subject to another, and depend on a number of physiological and physical circumstances.

The possibility of taking medication

Concerning the use of medication (Table IV), the study showed that the majority of patients took medication (66%). Analgesics were the most commonly taken type of medication, at 34%.

Conversely, in France, according to Bronnec and*al* in 2011, the systematic prescription of NSAIDs is indicated after the procedure has been performed, and then for 24 to 48 hours [2]. According to Sipaviciute and Manelien (2014), taking nonsteroidal anti-inflammatory drugs (NSAIDs), either immediately before surgery, before local anesthesia is administered, or immediately after the procedure has been performed, significantly reduces both intraoperative and postoperative pain [13].

Based on these results, it will then be essential to provide patients with a prescription for analgesics for optimal prevention of postoperative pain, and for patients to take their analgesic treatment at a fixed time (every 6 hours) for at least 48 hours.

Psychological impact of post-endodontic pain

Endodontic pain is a source of great fear for patients, and endodontic therapy can be responsible for significant pain, which can have a psychological impact on patients. Thus, the impact of pain is not only physiological or physical, but also psychological.

In the present study, due to the low representativeness of the sample, no factor was statistically correlated with postoperative pain.

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Three points were observed with regard to the psychological impact of postoperative pain (Table V): apprehension of pain (92%), fear of dentists (6%) and dental anxiety (12%).

- *Apprehension of pain*

Apprehension is defined as a fear in the face of danger that causes one to flee or avoid the situation. [20]

According to gender, pain apprehension was predominantly experienced by women (86%), indicating that women presented a higher level of anticipated pain than men, and according to age, 84.2% of patients with pain apprehension were aged between 18 and 24 (Table VI).

This result is consistent with the study by Catherine A and*al.* which found that women expected more sensory pain than men, and younger patients were more likely to expect higher levels of pain [21]. In view of these results, it may be that women are more concerned about pain and express it more, while men tend to minimize symptoms.

Studies of specific noxious stimuli and brain activity indicate that women are better able to discriminate between stimulus levels than men [22].

These distinctions may be linked to differences in cortical brain activity. It has been shown that although both genders show similar bilateral activation of the premotor cortex and several contralateral structures, women have greater activation of the insula and contralateral thalamus than men[23].

As such, it is certainly possible that this greater activation could be linked to greater pain expression in women.

Among the patients with pain apprehension, many presented pain of severe intensity (78.6%) and pain of moderate intensity (73.4%) (Table VII).

A similar result was observed by Watkins CA and*al.* They carried out a study on 333 patients to compare expected and experienced pain intensities following endodontic treatment. The results highlighted that pain actually experienced was less than pain apprehended, and that patients

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not apprehending post-operative pain developed pain of lower intensity than those expecting to experience pain [24].

It could be that the pain being assessed is memorized pain from previous experience.

- *Fear of dentists*

Fear of the dentist can be described as a subjective state of feeling or reacting to a known source of danger, latent in the unconscious [25].It is well known and dates back hundreds of years. The origin of fear of the dentist is associated with pain [26].

Fear of the dentist" is the specific stress of the dental world, a phenomenon that is widespread throughout the world [27].

The prevalence of fear of dentists among adults varies from country to country. Nevertheless, many studies estimate the prevalence of this fear in the world population at between 15 and 20%. [28,29]

In the present study, more men (23.8%) than women (10.3%) were afraid of dentists (Table VIII).

It could be that young men are confronted with various trials, some of which are physiological or even psychological, such as pain, which weakens their mental state due to a feeling they cannot master or control. The sensation of pain makes a man stressed and accentuates his stress by stimulating his uncontrollable imagination, often resulting in a state of fear. However, several studies have shown a higher prevalence in women. [40]

As for age, it was found that the 25-34 age group experienced more fear(45, 5%). (Table VIII), a similar finding was observed according to the American Psychiatric Association, estimating that young adults are more inclined to trigger fear [30].

In terms of intensity, 19.4% of patients afraid of dentists reported moderate pain intensity (Table IX).

A study by O'Keefe reported a significantly increased incidence of moderate to severe post-operative pain in patients with a history of painful dental treatment, and whose most severe pain in their lifetime was dental in origin [27]. This association could be explained by fear of the

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dentist, leading patients to consult only during the severe stages of pain. This was confirmed in this study for patients who had already undergone endodontic treatment. The latter perceived less severe post-operative pain.

- *Dental anxiety*

Anxiety is an emotional disorder manifested by an indefinable feeling of insecurity. It is characterized by a sense of apprehension, tension, uneasiness and terror in the face of a peril of indeterminate nature. [31]

Anxiety is a psychic state with a negative emotional manifestation that may be transient or part of a personality trait.

It is often linked to a painful stimulus and an increased perception of pain. As a result, these patients feel pain more easily and for longer. The average prevalence of dental anxiety ranges from 13.1% to 19.8% of the population. The etiology of dental anxiety is multifactorial. The two factors most frequently cited in the literature are a bad experience at the dental surgery and/or a family member [32].

The present study found that 17.2% of patients who experienced dental anxiety were female (Table X). This result corroborates the study by Perkovic et al, who found that the preponderance of females was 57.6%. [33]

According to Armfield JM, women are prone to signs of dental anxiety with higher scores than men[34].Similarly, several research studies assert that women are generally more anxious than men about dental care[35].

It could be that women, with their psychological and behavioural differences, as well as their fast-paced lives, are more confronted with the daily stresses that can lead to anxiety.

According to age, patients aged 45 to 54 (60%) and 18 to 24 (15.8%) were the most anxious (Table X).

In Perkovic's 2014 study, the highest age range was between 23 and 45 years, or 34% among anxious endodontic patients [36].

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Analysis of other authors' results clearly shows a clear proportion of anxious people among seniors. Similarly, several studies show that older people generally have a higher degree of dental anxiety than younger people [35].

The correlation between the present study and their research can be explained by the physical or physiological state of these patients, who no longer have the same alertness as before, and a present painful feeling can give rise to a state of stress that increases into anxiety.

As for intensity, it was observed that 23,08% of anxious patients had pain of moderate intensity and 21,4% had pain of severe intensity (Table XI).

Previous research has found that the intensity of post-endodontic pain in an anxious patient can vary according to the type and duration of endodontic treatment, the type and amount of local anesthesia, the type and dose of analgesics prescribed, as well as individual patient characteristics such as age, gender, general and oral health status, and previous dental experience. And the average intensity of post-endodontic pain in an anxious patient ranges from 2 to 4 on a 0-10 visual analog scale (VAS) [33].

Post-endodontic pain usually peaks in the first 24 hours after endodontic treatment, then gradually decreases over the following days. [33]

This may be because anxious patients tend to have negative expectations and overestimate the intensity of post-endodontic pain.

Conclusion

Post-operative pain is a subjective phenomenon, based above all on the patient's feelings, which makes it difficult to quantify, especially if the pain is not related to a lesion.

This study has shown that the characteristics of postoperative pain in endodontics vary from one subject to another, depending on the type, intensity, onset and even evolution of the pain. In addition, post-endodontic pain has psychological impacts such as pain apprehension, fear of the dentist and dental anxiety.

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Post-operative pain management must be an integral part of endodontic care, and its impact on patient psychology must not be underestimated. To this end, it is essential that patients are informed of the possible post-operative consequences.

Last but not least, an analytical study with representative samples would be desirable to gain a clearer picture of this pathology, which represents a real public health problem.

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