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Use of biomaterials in endodontic medication in Dakar

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Abstract
In its daily practice, the dental surgeon uses materials intended for short time, ensuring a transition towards proper treatments. In endodontics, several biomaterials are likely to be used in the treatment of pulp periapical diseases. The diversity of biomaterials obliges the practitioner to analyze all criteria of selection before establishing the indication of the biomaterial to use. This study aims to analyze the endodontic medication in clinical practice. It was a descriptive and cross-sectional study regarding dental surgeons practicing in Dakar. A little less than ¾ of dental surgeons (74.5%) perform one to four endodontic treatments daily. To justify their choice, 196 dental surgeons used these biomaterials because of their success in treatment. However, it is recommended that they receive continuous training in dentistry to update their knowledge and practice to provide patients with better care.

Keywords: clinical use, dental biomaterials, endodontic medication

1. Introduction

Dentistry is a science where the range of materials and tools available is sometimes complex and varied. Everyday, manufacturers offer a new way to treat patients or reduce working time. The materials used in endodontic practice are not immune to this reality [1].

The dentistry discipline, dealing with the prevention, the diagnosis and the treatment of pulpal pathologies and their periapical complications, is endodontics. The aim of any treatment, in particular in endodontics, is to maintain a tooth in a biological context closer to the physiology and thus preventing any development of inflammatory bone disease [2]. To achieve this goal, endodontics is based on two main principles to eliminate a dental infection:

- Complete cleaning of all necrotic pulp tissue, organic and inorganic debris and any dental tissue infected in the pulp chamber, the pulp canal as well as the immediate adjacent dentine by mechanical chemo-therapy;
- Fill-in the residual space as tightly as possible, for a successful treatment, using a wide variety of materials [1].

Thus, in its daily practice, the dental surgeon very often resorts to, in order to well carry out his treatments, the installation of materials for root disinfection, pulp sedation, temporization and provisional occlusal obturation**.** Such materials are the Calcium Hydroxide, the Mineral Trioxyde Aggregate MTA®, the EDTA®, the Arsenous Anhydride, the Sodium Hypochlorite, the Pulperyl and Rokle's, the Calcium Hydroxide which is very effective in the healing of peri-apical injuries. The Sodium hypochlorite, the Rockle's and the EDTA are very effective antiseptics in endodontic treatments. The Pulperyl is also a very good sedative. Biomaterials used for these purposes are called provisionary, transitory or temporary. If these three terms refer to the same objectives, that of temporary, by its etymology (of the Latin temporarius), state the notion of limited duration but adapted to therapeutic time.

In endodontics, several biomaterials are likely to be used for this purpose. The diversity of proposed biomaterials leads the practitioner to analyze all the selection criteria before indicating the biomaterial to be used. In fact, each biomaterial has different biological and physicochemical properties which must also be considered during the selection. Unfortunately, due to working habits, this therapeutic decision can sometimes be summarized in systematization and a simplification of biomaterials and procedures, compelling the practitioner to use a single biomaterial in almost any clinical situations he may face in. And, according to the saying: "a material can only be good if properly handled. A material can only be handled well if it is well known". It is in this perspective that this study's aim is to analyze the endodontic medication in the

clinical use of practitioners in oral structures in Dakar.

2. Materials and Methods

2.1 Study type

This was a descriptive, cross-sectional and analytical study about a population of practicing dentists surgeons.

2.2 Framework and study population

The survey was carried out in Dakar, where more than half of the demographic dental profession is located. It was regarding dental surgeons operating in private, public and parapublic structures and who joined the Dental Surgeons National College (DSNC).

2.3 Sampling

A comprehensive survey of all 286 dental surgeons listed by the Dental Surgeons Association of Senegal and practicing in Dakar was conducted.

2.4 Selection criteria

In this study, dental surgeons included are all those who obtained the degree of dental surgeon and are registered with the College, who were practicing at the time of the survey and who agreed to take part in the study. Dentists not included in this study are all those who refused to participate in the survey, as they are not registered with the College.

2.5 Collection process and studied variables

To be well carried out, the survey process called for some prerequisites. Dentists complete the questionnaires after obtaining explanations of all guidelines of the survey form. The spreadsheet included two parts; one regarding socio-demographic characteristics: gender, years of experiences, sector of work and localities, and a second one about the provided care and the use of biomaterials according to treatments. The study took place from July 13th, 2015 to December 14th, 2015.

2.6 Ethical considerations

Contact was made with heads of dental departments in public structures to suggest the survey and in private and para-public sectors, a direct contact was made with dental surgeons. Before the questionnaire was administered, the objectives and importance of the survey were explained to them.

2.7 Statistical analysis of the data

The Sphinx version 5 software made it possible to take a census of the data. SPSS version 18 software was used for data analysis and tabular presentations.

3. Results

200 practitioners out of 286 dental surgeons, members of the DSNC of Dakar took part in this study [Table 1].

Table 1: Distribution of dental surgeons, according to sociodémographic characteristics

Variables		Effectives	Percentages
Gender	Male	148	74%
	Female	52	26%
Number of Years of Experience	Less than 5 years	13	26,3%
	5 to 10 years	10	**20%**
	11 years and over	**27**	**53,7%**
Work sectors	Private	102	51%
	Public	64	23%
	Parapublic	34	17%
Localities	Department of Dakar	154	77%
	Others departments	45	23%

A little less than ¾ of dental surgeons (74.5%) perform one to four endodontic treatments per day.

Table 2: Distribution by biomaterials used for endodontic treatments

Biomaterials used	Effectives	Percentage
Pulperyl	185	92.00%
Rokle's	157	78.10%
Calcium Hydroxyde	191	95.00%
Sodium Hypochlorite	182	90.50%
Arsenous Anhydrite	131	65.20%
M.T.A	14	7.00%
E.D.T.A	1	0.50%

191 dental surgeons (95.00%) out of 200 use calcium hydroxide temporization or inter-sessional medication.

Table 3: Distribution according to justifying selections of used biomaterials

Reasons	Effective	Percentage %
Successful treatment	194	96,50%
Cost	153	76,10%
Packaging	19	9,50%
Instructions for use	114	56,70%
Indication	187	93,00%
Availability	91	45,30%
Conservation	5	2,50%

Most dental surgeons (N = 194 or 96.50%) use these biomaterials because of their success in treatments.

Table 4: Distribution by number of treatments performed per day by sector

Treatments / Sectors	1 to 4 N%	5 to 10 N%	11 and over N%
Public	37 18,5	26 13	01 0.5
Private	90 45	12 6	0 0
Parapublic	21 10,5	13 25,5	0 0
Total	148 74	51 25,5	01 0,5
	chi-2 = 21,21; ddl = 2; p-value = 0,01%		

Table 5: Distribution by type of biomaterials used in endodontic by sector

Biomaterials / Sectors	Pulperyl N%	Rokles N%	Calcium Hydroxyde N%	Sodium Hypochlorite N%	Arsenous Anhydrite N%
Public	58 6,7	48 5,6	62 7,2	58 6,7	57 6,6
Private	94 10,9	83 9,7	95 11,1	91 10,6	63 7,3
Parapublic	33 3,8	25 2,9	33 3,8	32 3,7	26 3
Total	185 21,6	156 18,2	190 22,1	181 21,1	131 17
chi-2 = 3,98; ddl = 8; p-value = 85,88%					

4. Discussion

4.1 The study challenges

Some difficulties were encountered during the survey such as some dental surgeons who refused to cooperate by holding back on the form they did not want to fill-in.

4.2 Sociodemographic characteristics

- ***According to the gender*:** Most dental surgeons were male (74%). Similar results were found by Jade Minkara in Toulouse, where 62.50% of dental surgeons were male [3]. According to Hasna Tidiani findings, in 2013, practitioners consisted of 62.5% male and 37.5% female, which shows a male predominance in the field [4] [Table 1].
- ***According to the locality*:** This study showed that the majority of dental surgeons (77.40%) worked in the Department of Dakar. This results were comparable to those obtained from Hasna Tidiani, 51.2% were in downtown Dakar [4] [Table 1].
- ***According to the sector*:** This study revealed that more than half of dental surgeons of the sample practice in the private sector (102 dental surgeons, which is 51.50%) compared to 31% in the public sector. Studies carried out in Toulouse showed that 94% of practitioners practiced in the liberal sector [3]. According to Ndiaye, among the 70 surveyed practitioners, 58.5% (n = 41) worked in a private capacity and 41.5% (n = 29) worked in the public sector, managed by the Social Action and Health Ministry [5] [Table 1].
- ***According to the number of years of experience*:** More than half of dental surgeons surveyed (68.50%) were young and had (1 to 15 years of experience). These results were similar to those obtained in Toulouse, France, where most dental surgeons were young with 2 to 12 years of experience [3]. According to Salamé Houssein Brahim, the number of dental surgeons who had completed their studies for less than 5 years ago and those between 5 to 10 years was higher, with a percentage of 49.36% and 32.9% respectively [Table 1].

4.3 According to the number of treatments performed per day and per dental surgeon

This study showed that the majority of dental surgeons (149) performed 1 to 4 endodontic treatments per day in Dakar, which is 74.50**%,** 25% of practitioners performed between 5 and 10 endodontic treatments per day and only 1 practitioner performed more than 11 endodontic treatments daily. However, all dental surgeons performed at least one endodontic treatment per day. This choice was justified by criteria such as the indication, the success of the treatment and the cost. According to Ndiaye A., all practitioners, except one from the private sector, performed endodontic treatments in their practice [5]. According to Hasna Tidiani, there was a greater number of treatments for root and conservative treatments (74.4%) for daily therapeutic treatments in OCE [4] [Fig. 1].

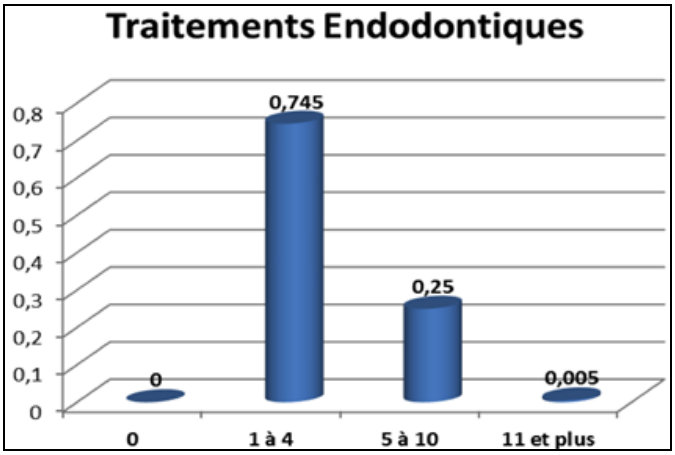

Fig 1: Distribution according to number of performed treatments per day, per dental surgeon

4.4 Biomaterials used in endodontic treatments

Out of 200 dentists surveyed, 191 (95%) used calcium hydroxide. Sodium hypochlorite remains the standard solution (gold standard) for endodontics. It is very effective during the treatment by its solvent action on organic matter (bacteria, pulp debris, organic screen of dentin), but its action is not durable [6]. It is known to be a powerful antimicrobial agent. But its effectiveness would be directly related to the concentration of the solution: higher concentrations allow better dissolution of organic tissues and greater antimicrobial activity [7]. Nine out of ten dental surgeons used sodium hypochlorite which is known to be a potent antimicrobial agent, but its in vivo efficacy is subject to a few constraints as it becomes dependent to the application period, the renewal and the concentration, which could induce a relative cytotoxicity on tissues [8, 9]. The low use of Mineral Trioxyde Aggregate (MTA®) and EDTA by dental surgeons in Dakar is due to a lack of knowledge about biomaterials, or lack of control of product handling. It is reported that the EDTA power as an antiseptic is very limited [10]. Used in initial rinsing, this causes erosion of the peritubular and intertubular dentin, which can make the treated teeth more prone to vertical fractures [11, 12]. As for the Mineral Trioxyde Aggregate (MTA®), beyond its immediate action on the ductal content, its substantivity on the MTA had been proven over a period of 28 days [13, 14]. Moreover, the arsenous anhydride used in the devitalization of inflamed pulps was the subject of much controversy because of the focal infection it was likely to cause. Thus, it was abandoned in Anglo-Saxon countries and in France, where it is considered until now as a dangerous product. However, it was still being used in developing countries where it occupies an important place in the daily practice, especially in endodontic treatments of irreversible acute pulpitis. The use of arsenous anhydride calls, beforehand, for some requirements such as the diagnosis, the caries cavity, the pulp proximity, the temporary filling cement [15] [Table 2].

According to the choice of biomaterials used

For the three criteria selected, 196 dental surgeons (96.50%) used these biomaterials because of their success in treatment, 187 dental surgeons (93%) used them because of their indication and 153 dental surgeons (76.1%) used them because of their cost. According to Hasna Tidiani, in the public as well as the private sector, reasons for the choice of biomaterials are almost the same. This choice is made because of the indication, the success of the treatment, the preservation, the cost and the availability on the market [4] [Table 3].

Analytical results

The number of acts performed per dentist per day was 1 to 4 treatments with 45% by the private sector, 18.5% by the public sector and 10.5% by the parapublic sector. This difference, between activity sector, was statistically significant with p=0.01. Regarding the type of biomaterials used according to sectors, the difference was statistically insignificant [Table 4, Table 5].

5. Conclusion

The endodontic medication plays a fundamental role and is an integral part of the treatment after the sequence of cleaning or root canalization. Practitioners justified their choice by the success of treatment, the indication and the cost. However, some products whose use has long been exceeded in developed countries continue to be the subject of unjustified practice in our countries. It is therefore important, at the level of public authorities as well as at the level of structures involved in the management of the profession, to find a strong consensus on all products and instruments necessary in all acts performed in odontology. We recommend that dental surgeons perform ongoing training in dentistry to update their knowledge and practice to provide patients with better care.

6. Acknowledgments

Not applicable

7. References

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