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ORIGINAL RESEARCH

ORAL MUCOSITIS IN PEDIATRIC ONCOLOGY PATIENTS TREATED WITH ANTINEOPLASTIC DRUGS: THE ROLE OF THE DENTAL TEAM IN THE PREVENTION AND TREATMENT

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Abstract

Background: In pediatric oncology population, oral mucositis as a consequence of chemotherapy is a highly prevalent complication which strongly affects both the quality of life and treatment possibilities of the patients. Still, the role of a dental team (dentist and hygienist) is not yet central and always present during diagnosis, recovery and follow up of these patients. The aim of this study is to assess the efficacy of dental team role in prevention and treatment of oral mucositis in pediatric oncology patients.

Materials and Methods: A dental team composed by a Dentist and two hygienists has been established to be disposable once a week rotating to the SOSD Oncoematologia Pediatrica of Azienda Ospedali Riuniti Presidio G. Salesi from the first of September 2022 till June 2024. The members of the team carried out visits and provided instructions of oral hygiene and tested different types of products for oral mucositis in 120 patients based on WHO grading and Wong-Baker faces pain rating scale. At the end by a dichotomous questionnaire was asked to all 120 patients' parents if the role of dental team in this study was appreciated and useful in prevention and treatment of oral mucositis.

Results: Pediatric oncology patients and their parents appreciated the constant presence of a member of the dental team. Information and oral hygiene were crucial preventing mucositis and continuous follow up allowed timely management of this complication showing function improvement in 65.1% of cases and pain reduction in 87.15%.

Conclusions: Our experience highlights that dental team interventions positively impact. These findings suggest that dental team role should be developed to provide better cancer care for parents and their children.

Keywords: pediatric oncology, malignant tumor, oral mucositis, chemotherapy, radiotherapy, immunotherapy

INTRODUCTION

In Italy the annual incidence of malignant tumor in the pediatric population aged between 0 and 14 years is 1400 cases, while 800 in 15 to 19 years population. In the last 40 years the mortality rate of pediatric tumors has changed significantly and it is in sharp decline. Children and teenagers who die for cancer are increasingly fewer: in 2008 the deaths were about a third of those recorded in the early Seventies, and today over 80% of patients recover [1-2].

In the last 15 years the research has made huge stepsabout the treatment of these tumors, in fact the 5-years survival rate after diagnosis is about 82% in patients aged between 0-14 years and 86% in 15-19 years; statistics show that 3/4 of them are cured. Even if the study of more effective treatments based on the analyses of cancer genome without side effect is the object of modern researches, today the most used therapies are chemotherapy[3], radiotherapy and immunotherapy[4].

However, these are associated with various side effects such as oral complications that can occur during and after antineoplastic treatment in 30% to 100% of cases [5-8]. These include oral mucositis, bacterial and mycotic opportunistic infections during chemotherapy [9] or reactivation of herpes simplex post-radiotherapy [10], salivary gland dysfunction, dysgeusia, trismus [11], bleeding, dentofacial anomalies, GVHD (graft versus host disease) [12]. The severity of these side effects is highly variable and in the most severe cases can lead to a delay or even suspension of antineoplastic therapy [13-14].

Oral mucositis is one of the most frequent and disabling complications for pediatric patients [5,7]; it affects 20-40% of subjects undergoing conventional chemotherapy and 80% of high-dose chemotherapy as preliminary treatment to hematopoietic stem cell transplantation, in addition, almost all subjects receiving head and neck radiation develop some degree of mucositis [15]. Pediatric patients are more susceptible to develop OM (oral mucositis) due to their intense cell turnover [16]. Historically, the terms stomatitis and mucositis have been interchangeably in the literature, but not reflect the same process. The definition of mucositis emerged in the late 1980s and describes inflammation of the oral mucosa induced by chemotherapeutic and radiotherapy agents, while stomatitis refers to any inflammatory condition of the mouth, including teeth and periodontal tissues. Clinically oral mucositis can present a very heterogeneous pattern: from a tingling sensation to a severe burning pain that prevents same vital function like eating, drinking, speaking and swallowing. At the beginning the inflammation consists of an epithelial atrophy associated with erythema and bleeding, then ulcerations appear. The most severe forms present pseudomembranes and the possibility of mucosal damage dissemination to the pharynx and all gastro-intestinal tract; in these cases the risk of secondary opportunistic infection is higher, especially in neutropenic patients undergoing hematopoietic stem cell transplantation who may develop sepsis or systemic compromise, needing total parenteral nutrition (TPN) and analgesic therapy with opioids. Anyway the severity and the width of mucosal damage strictly depend on general condition of the patient (age, neutrophil count, presence of systemic pathology) [17] and above all on type of medication, administration way, dose and frequency [18].

Biopathology

Oral mucosa is composed of non-keratinized epithelial cells which reproduce each 7-14 days and the bio-pathological mechanism underlying the damage is complex. Over time, the theory proposed by Sonis et al. in 1998 [19] including only the basal layer in damaging induced by chemo and radiotherapy with impossible cell replication and consequent reduction, atrophy and ulceration has been influenced by new molecular and histological knowledge. Therefore, a new theory born, in which not only the epithelium but the interaction of all mucosa's element, including extracellular matrix, contributing to the damage [20].

Consisting of 5 stages:

1. INITIAL TISSUE INJURY PHASE: chemotherapy and radiotherapy damage cell's DNA directly or indirectly producing ROS (Reactive Oxygen Species).
2. PRODUCTION AND HYPER-REGULATION OF MESSAGE SIGNALS: the expression of genes like c-jun, c-fos and Erg-1 active nuclear factors transcription like NF-kB or vascular adhesion molecules and consequently the up regulation of genes responsible of pro-inflammatory cytokines production such as IL1 and TNFa which lead to apoptosis.
3. SIGNAL AMPLIFICATION: cytokines collecting in tissues induce damage directly or indirectly. Changes in oral mucosa are visible 5-10 days after myoablative treatment and is like atrophy with severe erythema. This phase precedes clinically the mucositis.
4. ULCERATION: loss of integrity of mucosal barrier with painful and possible bacterial colonization after 7-11 days. Typically localized on non-keratinized mucosa in particular mouth's floor, buccal mucosa, labial mucosa and tongue [21].
5. HEALING: scarring and tissue healing thanks to fibroblasts when the pharmacological insult stopped and when neutropenia resolve.

Role of dental team

In spite of mucositis can compromise pediatric patients' quality of life, the "Halo Effect" is unfortunately increasing in their parents. This effect is represented by the fact that cancer diagnosis has a such strong and shocking emotional impact on them and for that reason they focus all attention on medical aspects related to antineoplastic treatments, underestimating any side effects in other areas of body like oral cavity [22-23-39-40].

Dentist and hygienist role is not always central nor present during phases of diagnosis, antineolpastic treatment and follow up of oncology pediatric patients, but due to correlation between chemo-radiotherapy and mucositis and above all the great negative impact of that in patients' lives [24], is essential to inform parents, try to prevent or treat this complication. Despite the lack of literature data, is evident that oral preventive treatment

reduces incidence of complications like mucositis [25].

Italian guidelines of the Ministry of Health of February 2018 shows dental protocols that allow monitoring and treating this type of patients from cancer diagnosis [26]. A first dental visit is essential before starting antineoplastic therapy to maintain a good level of oral hygiene and prevent oral complications. Furthermore all patients have to receive adequate oral education in order to acquire the ability to properly clean their teeth and mucosa. Sealings and fluoride prophylaxis are proposed as preventive measures while odontology treatments includes fillings carious elements, endodontic therapy, extraction of compromised teeth, decontamination of orthodontic appliance. In presence of oral complications deriving from antineoplastic therapy like mucositis treatment protocols could be followed; Dental team can collaborate with oncologists in order to improve patients' standard of living and guarantee closeness to their families [27].

For that reason, the aim of this study is to evaluate the effectiveness of dental team the SOSD of Pediatric Oncohematology of G. Salesi University Hospital in Marche (Italy) from 1 September 2022 till June 2024 about prevention and treatment of oral mucositis in pediatric oncology patients.

MATERIALS AND METHODS

A dental team composed by a dentist and two hygienists has been established to be disposable once a week rotating to the SOSD Oncoematologia Pediatrica of Azienda Ospedali Riuniti Presidio G. Salesi from the first of September 2022 until June 2024. All patients read and signed the informed consent to participate in the study and the guidelines outlined in the Declaration of Helsinki for human experimentation were followed.

120 patients aged between 0-14 years affected by different type of tumor like 46% LLA (acute lymphoblastic leukemia), 16% Lymphoma, 13% SNC Malignant Tumor (Glioma), 8% SNA Tumor (Neuroblastoma), 7% Soft Tissue Sarcoma, 5% Kidney cancer, Bone cancer, retina, thyroid and rare forms have been considered.

At the moment of tumor diagnosis, the dental team carried out a first visit and the medical history folder was completed (Fig. 1).

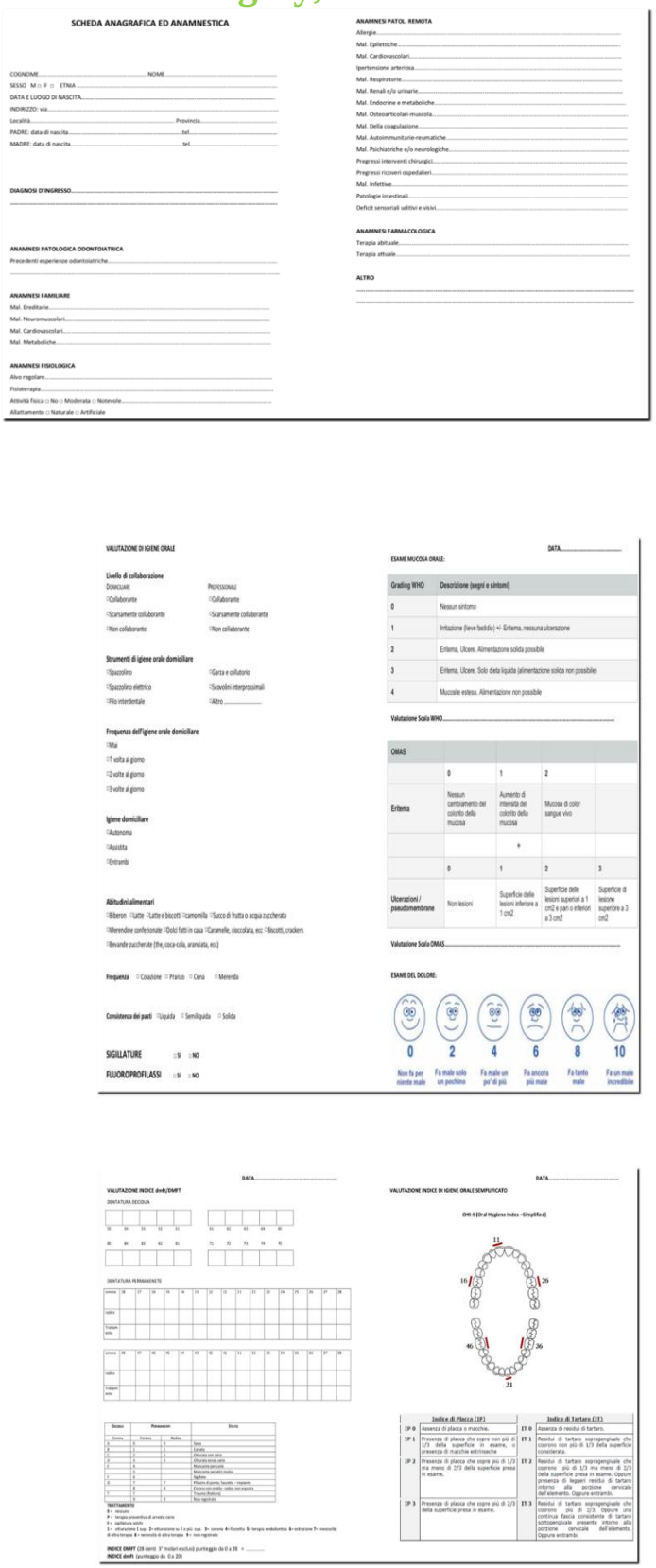

Figure1. Medical history folder; highlighted the second page about oral hygiene

Has been particular highlighted the anamnestic section relating oral hygiene and patient's level of collaboration, hygiene tools used at home, eating habits, meal frequency, meal consistency, sealings and fluoride prophylaxis were investigated.

This in-depth examination allows to evaluate whether the patient is a potential subject at risk of developing more easily mucositis or oral problems (Fig. 1).

Therefore, following the Guidelines of the Italian Ministry of Health of February 2018 [26] adequate oral hygiene education and infective foci decontamination were carried out before starting any antineoplastic therapy especially in those cases, in which profound and prolonged immunosuppression was foreseeable for hematopoietic stem cell transplantation, provided that neutrophil count was > 10007mm3 and platelets>8000/mm3. Infective foci decontamination consists of all dental procedures that allow restoration of oral health reducing infective risk such as: professional oral hygiene, fillings, endodontic treatment of no vital teeth or with pulp inflammation, extraction of compromised teeth, elimination or decontamination of orthodontic appliances that represented a source of massive plaque colonization, periodontal therapy. These treatments were performed according to oncologists based on the state of the disease at the SOSD of Surgical and Special Dentistry of University Hospital Umberto I Marche (Italy). If there was no collaboration by patients they were underwent to general anesthesia or deep venous sedation; in that case was necessary to expand the available team including a nurse and an anesthetist. Furthermore all 120 patients was prescribed the use of a Galenic Mouthwash (composed by 2 bottle (100ml) of Sodium Bicarbonate 8.4%, 1 bottle of Tantum Verde®, 1 bottle of Mycostatin®) as preventive measure for mucositis used at least 2 rinses per day throughout all antineoplastic treatment.

During weekly follow-ups and after the antineoplastic therapy beginning, mucosal barrier breakdown and consequent mucositis occurred in 109 out of 120 patients (90.8% mucositis). To this 90.8 % of patients with mucositis were assessed and added to anamnestic folder the Clinical Grading of mucositis using two scales, WHO [28] and OMAS [29]. The painful symptoms and functional limitations were recorded using the ChIMES classification (Children's International Mucositis Evaluation Sale) [30] which uses the Wong-Baker scale created specifically for pediatric patients.

WHO scale identifies the degree by a visual staging and symptoms, assigning a value from 0 to 4:

- 0 : no symptoms
- 1 : irritation (mild discomfort)+/- erythema, no ulcers
- 2 : erythema, ulcers, solid diet possible
- 3 : erythema, ulcers, liquid diet (solid diet not possible)
- 4 : extended mucositis, diet not possible

OMAS scale combines two parameters (erythema and ulcers/pseudomembranes) giving them a number value and adding together:

-ERYTHEMA :

- 0 no change in mucosa color

- 1 increse mucosal color intensity

- 2 bright blood color mucosa

-ULCERS/PSEUDOMEMBRANES :

- 0 no lesions

- 1 lesion surface area < 1cm2

- 2 lesion surface area between 1cm 2 e 3 cm2

- 3 lesion surface area >3cm2

In presence of clinical mucositis, some therapeutic protocols have been applied used different devices like:

- CURASEPT PREVENT® (Curasept SpA; Saronno; IT) mouthwash with an innovative formula with postbiotics ozonized with olive oil suitable for restoring oral microbiota and increasing mucosal defenses (25 patients)
- VEA LIPSTICK®(Vea Srl; Aprilia; IT) lipgel protective lip balm rich in vitE
- DECA® (sedo-calcio-gola) (Laboratorio chimico Deca; Milano; IT) nutritional supplement spray rich in vitE, wheat bud oil and myrrh extract (24 patients)
- MUCOSYTE® (Biopharm Srl; Milano; IT) protective bioadhesive gel in sachet for regenerate oral mucosa (25 patients)
- AFTASOL® (Healmann Health Care Srl; San Canzian D'Isonzo; IT) strawberry flavoured spray (20 patients)
- NOVOX DROPS® (Novox; Novara; IT) for mucosal lesion treatment, recommended several applications per day for 7-30 days (15 patients)

Every week patients were visited and grading evaluation was repeated, modulating the therapy.

At the end of mucositis therapy was also administered a questionnaire to patients with dichotomous answer (yes/no) about products used. Examines about:

- APPLICATION METHOD
- PAIN REDUCTION AFTER APPLICATION
- PLEASANT FLAVOUR
- FUNCTION IMPROVEMENT (DRINK OR EAT) AFTER APPLICATION

- REDUCTION OF OPIOIDS ANALGESICS REQUIREMENT
- REDUCTION OF ORAL PATHOGENS COLONIZATION (assessed by laboratory-processed oral swabs or biopsies to analyze the presence of superinfections such as Candida, Herpes simplex, Gram -, Pseudomonas, Escherichia coli, Klebsiella, Neisseria)

The dental team effectiveness is evaluated based on three parameters: improvement of vital functions in case of mucositis after treatment, pain reduction after treatment and through degree of appreciation expressed by parents. At first were collected all the answer (pain reduction, pleasant flavor, function improvement, opioids reduction, colonization reduction) given by patients divided in groups according to different device used. If the answer "YES" was given by more than 50% of patients per group the result parameter analyzed is YES, if by less than 50% is NO. Subsequently, were summed the answers of all the groups regarding the analyzed parameters and final result was obtained using the previous method. In a table (Table 1) were summarized all results about each product for group.

In a different dichotomous questionnaire was asked to all 120 patients' parents if the role of dental team in this study was appreciated and useful in prevention and treatment of oral mucositis.

Table 1. Results of first questionnaire about each device used by 109 out of 120 patients who developed mucositis

MEDICAL DEVICE	APPLICATION METHOD	PAIN REDUCTION	PLEASANT FLAVOUR	APPROVE EATING/ DRINKING	REDUCE OPPIOID ANALGESICS NECESSITY	REDUCE ORAL PATHOGENS COLONIZATION	N. PATIENTS
MUCOSYTE	ORAL RINSE	YES (22/25)	YES (22/25)	YES (22/25)	NO (0/25)	NO (0/25)	25
CURASEPT PREVENT	ORAL RINSE	YES (23/25)	YES (23/25)	YES (23/25)	NO (0/25)	NO (0/25)	25
SEDO-CALCIO GOLA	SPRAY	YES (21/24)	YES (21/24)	YES (21/24)	NO (0/24)	NO (0/24)	24
NOVOX	GEL	YES (12/15)	NO (3/15)	NO (3/15)	NO (0/15)	NO (0/15)	15
AFTASOL	SPRAY	YES (17/20)	YES (17/20)	NO (2/20)	NO (0/20)	NO (0/20)	20
TOTAL		95/109 87.15 %	86/109 78.9 %	71/109 65.1 %	0/109 0%	0/109 0%	109

In a different dichotomous questionnaire was asked to all 120 patients' parents if the role of dental team in this study was appreciated and useful in prevention and treatment of oral mucositis.

RESULTS

For each group of patients undergoing to treatment, some parameters were investigated and for each one the evaluation was reported in a table (Table 1). Each evaluation corresponds to the answers reported by more than 50% of people in each group subjected to a single device. Is highlighted that:

- MUCOSYTE®: YES pain reduction, YES pleasant flavor, YES function improvement, NO reduction of opioids analgesics requirement, NO reduction of oral pathogens colonization
- CURASEPT PREVENT®: YES pain reduction, YES pleasant flavor, YES function improvement, NO reduction of opioids analgesics requirement, NO reduction of oral pathogens colonization
- SEDO-CALCIO-GOLA®: YES pain reduction, YES pleasant flavor, YES function improvement, NO reduction of opioids analgesics requirement, NO reduction of oral pathogens colonization
- NOVOX®: YES pain reduction, YES pleasant flavor, NO function improvement, NO reduction of opioids analgesics requirement, NO reduction of oral pathogens colonization
- AFTASOL®: YES pain reduction, YES pleasant flavor, NO function improvement, NO reduction of opioids analgesics requirement, NO reduction of oral pathogens colonization

From that was possible to deduce that:

- pain reduction in 95 patients out of 109 so 87.15 % of cases regardless of devices used
- Pleasant flavor in 86 patients out of 109 so 78.9 % of cases, NOVOX® is the only device without a good flavor
- Function improvement (eat or drink) in 71 patients out of 109 so 65.1% of cases
- Reduction of opioids analgesics requirement in none 0% cases regardless of device used
- Reduction of oral pathogens colonization in no-one 0% cases regardless of device used

To give more support at the study 5 patients were thoroughly examined, each with a specific tumor, reporting Grading by WHO scale and pain evaluation according to Wong-Baker scale during weekly follow up (Fig.2 to Fig.6).

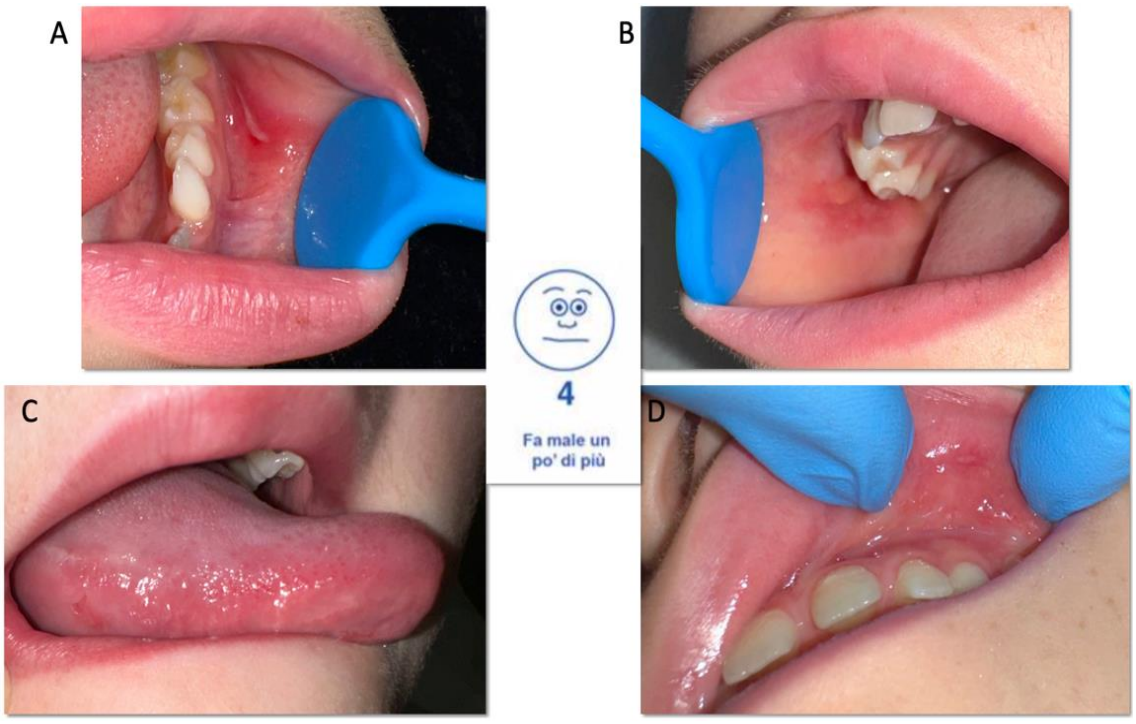

Figure2. Patient affected by LLA-B ; WHO Grading 2; pain grade 4 ;
(A)Intraoral photo III quadrant, (B) intraoral photo I quadrant, (C) intraoral photo right site of tongue, (D) intraoral photo II quadrant

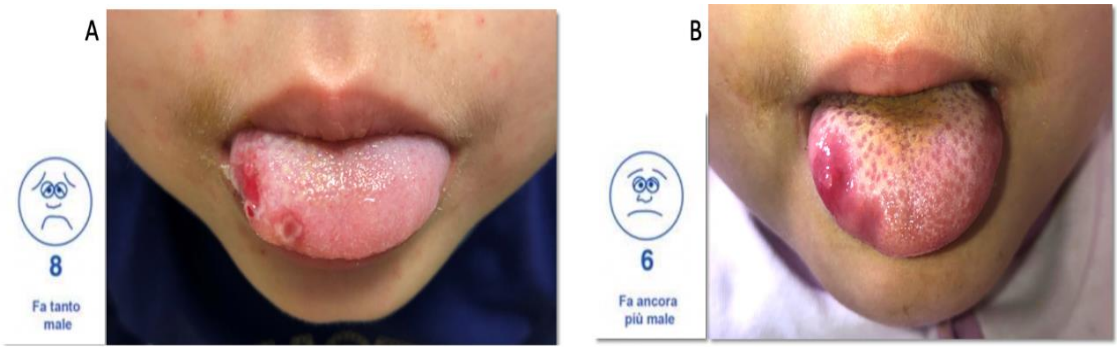

Figure 3. Patient affected by Medulloblastoma; WHO Grading 3;
(A) intraoral photo of right site of tongue initial and pain grade 8 , (B) intraoral photo right site of tongue and pain grade 6

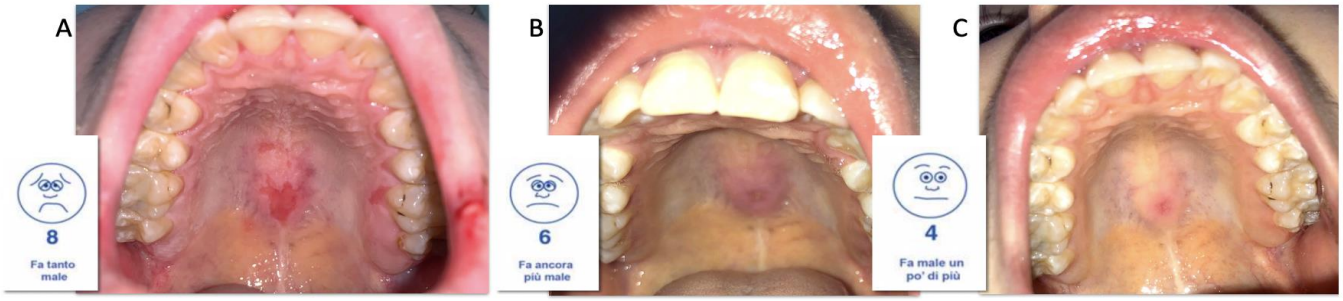

Figure 4. Patient affected by Embryonal Metastatic Rhabdomyosarcoma; WHO Grading 3;
(A)intraoral photo of palate and pain grade 8, (B) intraoral photo of palate and pain grade 6,(C) intraoral photo of palate and pain grade 4

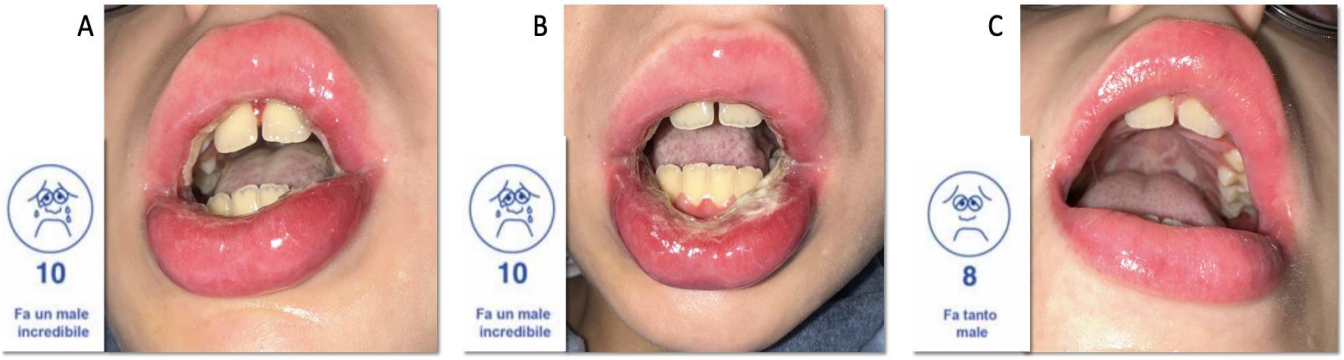

Figure 5. Patient affected by Burkitt Lymphoma ; WHO Grading 4;(A)extraoral photo of mouth and pain grade 10, (B) extraoral photo of mouth and pain grade 10, (C)extraoral photo of mouth and pain grade 8

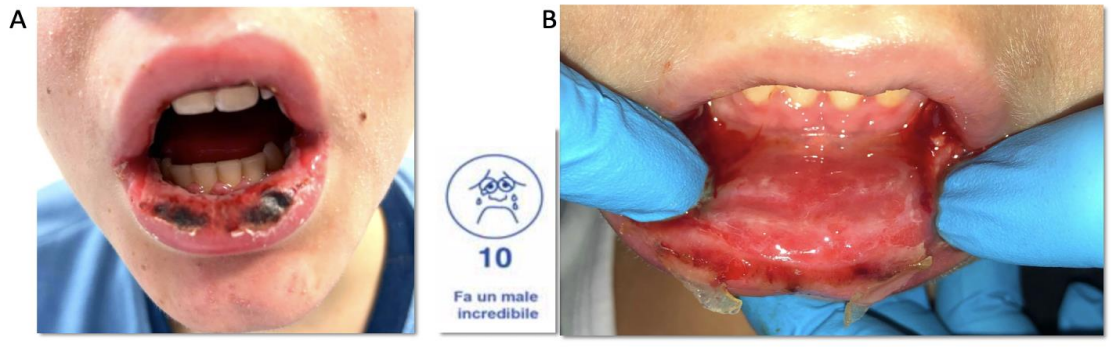

Figure 6. Patient affected by LLA-B; WHO Grading 4;

(A)Extraoral photo of inferior lip and pain grade 10, (B) intraoral photo of inferior vestibule and pain grade 10

Supporting the hypothesis of this study, according to which using devices for mucositis treatment and the proximity of dental team could lead to a better healing and could be helpful for pediatric patients, 5 patients were deeply examined during their follow ups.

- Patient affected by LLA-B, WHO Grading 2 with erythema, ulcers, solid diet possible and pain grade 4 (Fig. 2A,2B,2C,2D) photo of 01/09/23. First methotrexate administration on December 2022: therapy with galenic mouthwash + Vea Oris (liquid diet possible). Second methotrexate administration on January 2023, therapy with Novox (2 per day) is reported a rapid healing of lesions but an unpleasant taste of device
- Patient affected by Medulloblastoma, WHO Grading 3 with erythema, ulcers, liquid diet possible, initial pain grade 8 and final 6 (Fig. 3A and Fig. 3B. First check on 10/10/22 (Fig. 3A): therapy with Contramal for pain (grade 8) + Galenic mouthwash+ Vea Oris (only liquid diet possible). Second check on 24/10/22 (Fig. 3B): after two weeks of treatment pain decreased (grade 6) and solid diet was possible
- Patient affected by Embryonal Metastatic Rhabdomyosarcoma with palatal lesions, WHO Grading 3, initial pain grade 8, at second check 6 and at last 4 (Fig. 4A,4B,4C). First check on 05/09/22 (Fig.4A) initial mucositis with moderate pain (grade 8) and difficult solid diet; start therapy with galenic mouthwash+ Sedo-calcio-Gola. Second check on 12/09/22 (Fig. 4B): Healing improving after therapy and pain reduction (grade 6). Third check on 19/09/22 (Fig. 4C): healing almost complete and pain improvement (grade 4)
- Patient affected by Burkitt Lymphoma, WHO Grading 4 with extensive mucositis and no diet possible. Initial pain grade 10, second check 10 and at last 8. (Fig. 5A,5B,5C) the only check reported was the last photo of 27/02/23 (Fig. 5C) and the therapy was morphine used before oral hygiene+galenic mouthwash +Film OS+ Novox. Due to severe lesion and pain the only possible diet is parenteral but is still found an improvement of pain after treatment (from grade 10 to grade 8)
- Patient affected by LLA-B, WHO Grading 4 with severe labial lesions, impossible function and pain grade 10 (Fig. 6A and Fig. 6B). The only check reported is the second photo (Fig. 6B) of 07/ 11/22 and therapy was morphine before meals+galenic mouthwash+Vea Oris+Novox

The close collaboration between dental team and pediatric oncologists guarantee an early diagnosis, monitoring and implementation of therapeutic protocols for mucositis treatment finding positive effects for parameters analyzed in particular pain reduction and function improvement. In second questionnaire 100% case (120 patients) appreciated the constant weekly support by a member of dental team and oral hygiene instruction.

DISCUSSION

The aim of this study is to highlight the role of dental team in the management of oral complications, in particular mucositis, in pediatric oncology patients undergoing antineoplastic therapy. A dental examination before antineoplastic therapy and the effects of different products were recorded during weekly follow-ups. The winning strategy was to monitor constantly patients, managing their treatments protocols and check the level of oral hygiene weekly.

Oral hygiene serves to prevent formation of biofilm that constituting bacterial plaque on teeth and especially mucosa, helping to maintain integrity of tissue and preventing infections [31]; has also been suggested that the oral microbiota can potentially exacerbate mucositis leading to delayed healing by enhancing apoptosis and pro-inflammatory proteins [32].

Scientific evidence supports that treatments protocols including information and education on systematic cleaning of teeth and mucosa are the best practice to prevent oral consequences combined with follow up [33-34]. Moreover oral preventive treatment reduces incidence of complications like mucositis [26]. For that reason, the first step was to frame the patient and his profile of risk, having a greater control for those who presented lack oral hygiene or bad habits already at first visit.

Therefore the continuous follow up on patients allowed to evaluate the evolution of lesions due to antineoplastic therapy, acting promptly in those cases in which vital function were limited and pain was severe. Some protocols were used on all patients to prevent onset of any complications (Galenic mouthwash) others due to severity and grading of mucositis. Results in table 1 show that the use of protocols and follow ups led to a pain reduction in 87.15 % of cases regardless of devices used and function improvement in 78.9 % of cases. These results validate the hypothesis about effectiveness of dental team in oral mucositis management.

To 120 patients' parents was asked by a questionnaire if the weekly presence of a dental team in the management of oral complications was effective and in 100% of cases

the answer was affirmative, also supported by the pain reduction and function improved after therapeutic protocols used.

According to the American Academy of Pediatric Dentistry (AAPD), pediatric dentists play an important role in the diagnosis, prevention, stabilization, and management of oral and dental conditions that can impair a child's quality of life before, during, and after immunosuppressive treatments and/or head and neck radiation [27, 35]. The study conducts by Nunez et al. [36] confirm that professional planned dental treatment during antineoplastic therapy produces an improvement of quality of life in patients highlighting that dentist role is crucial. Professionals are responsible for providing patients with information about the importance of good oral health [37] and prevention of radio-chemotherapy complications and for establishing oral hygiene protocols and preventive measures accessible to patients. The literature update written by Ferrández-Pujante et al. [38] also shows that the use of standardized protocols based on prevention and treatment from early stages can avoid or minimize oral complications and the side effects of cancer therapies, improving the quality of life of children.

Due to immunosuppression induced by antineoplastic therapy, has been also noted that 100% of subjects with mucositis showed positivity for oral superinfections in swabs or biopsies. In patients with such a compromised immune system and mucosa breakdown the presence of pathogens such as Candida, Herpes simplex, Gram -, Pseudomonas, Escherichia coli, Klebsiella, Neisseria is more common [9-10]. Therefore weekly observation allowed monitor mouth because these infections do not have the same clinical appearance as normal ones [38] and modulating the therapeutic plans by introducing antibiotics, antifungals and antivirals since the devices used in the study were not effective in resolving superinfection. So thanks to follow-ups conducted by dental team, was possible to prevent problems like sepsis or bacteremia and try to improve the subject's quality of life.

Overall, the presence of a dental team in the management of oral complications in pediatric oncology patients has met with considerable approval among the study participants. First of all because it was possible to reduce problems (pain and limitation of functions) acting promptly on a weekly basis and in second time because having a reference figure to rely on and by whom to be followed during such an important antineoplastic treatment can generate psychological and emotional implications such as tranquility and gratitude The limits of this study are related to the used of Wong-Baker scale because pediatric patients identify pain level through a smile and not an objective data. However the literature defines this classification reliable [30]. The second limit lies in a single question questionnaire regarding the degree of appreciation of dental team only in a qualitative way.

CONCLUSION

This clinical experience highlights that dental team intervention have had a positive impact on pediatric patients and their parents. Would be necessary in future to expand research investigating about the role of dental team and the central importance in improve quality of life. Given the limitations of this study due to use of less objective pain scales, future studies could focus on a quantitative parameters of evaluation dental work and a randomized clinical trial.

DECLARATIONS

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Conflict of Interest
None declared

REFERENCES

1. Zecca M, Ferrari A, Quarello P, Rabusin M, Balduzzi A, Buldini B, Rostagno E, Prete A, Favre C, Massimino M, Biondi A, Porta F, Biffi A, Locatelli F, Pession A, Fagioli F. Childhood cancer in Italy: background, goals, and achievements of the Italian Paediatric Hematology Oncology Association (AIEOP). Tumori. 2021 Oct;107(5):370-375.
2. Pastore G, De Salvo GL, Bisogno G, Dama E, Inserra A, Cecchetto G, Ferrari A; TREP Group; CSD of Epidemiology Biostatistics, AIEOP. Evaluating access to pediatric cancer care centers of children and adolescents with rare tumors in Italy: the TREP project. Pediatr Blood Cancer. 2009 Aug;53(2):152-5.
3. J. A. Garrocho-Rangel, M. Herrera-Moncada, R. Márquez-Preciado, F. Tejeda-Nava, J. J. Ortiz-Zamudio, A. Pozos-Guillén (2018) "Oral mucositis in paediatric acute lymphoblastic leukemia patients receiving methotrexate-based chemotherapy: case series", *European Journal of Paediatric Dentistry*, 19(3), pp239-242.
4. Forrest SJ, Geoerger B, Janeway KA. Precision medicine in pediatric oncology. Curr Opin Pediatr. 2018 Feb;30(1):17-24.
5. Miller MM, Donald DV, Hagemann TM. Prevention and treatment of oral mucositis in children with cancer. J Pediatr Pharmacol Ther. 2012;17:340–350.
6. Sonis ST. Oral mucositis in cancer therapy. J Support Oncol. 2004 Nov-Dec;2(6 Suppl 3):3-8.
7. Lalla RV, Bowen J, Barasch A, et al. MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. Cancer. 2014;120:1453–1461
8. Sonis ST, Elting LS, Keefe D, et al. Perspectives on cancer therapy-induced mucosal injury: pathogenesis, measurement, epidemiology, and consequences for patients. Cancer. 2004;100: 1995–2025.

9. Whittle SB, Williamson KC, Russell HV. Incidence and risk factors of bacterial and fungal infection during induction chemotherapy for high-risk neuroblastoma. Pediatr Hematol Oncol. 2017 Aug;34(5):331-342.
10. Ramirez-Fort MK, Zeng J, Feily A, Ramirez-Pacheco LA, Jenrette JM, Mayhew DL, Syed T, Cooper SL, Linden C, Graybill WS, French LE, Lange CS. Radiotherapy-induced reactivation of neurotrophic human herpes viruses: Overview and management. J Clin Virol. 2018 Jan;98:18-27.
11. Assas M, Wiriyakijja P, Fedele S, Porter S, Ní Ríordáin R. Measurement properties of patient-reported outcome measures in radiotherapy-induced trismus. J Oral Pathol Med. 2019 May;48(5):351-357.
12. Defabianis P, Braida S, Guagnano R. 180-day screening study for predicting the risk factors for developing acute oral Graft-versus-Host disease in paediatric patients subjected to allogenic haematopoietic stem cells transplantation. Eur J Paediatr Dent. 2010 Mar;11(1):31-4.
13. Marchetti, E., Ratta, S., Mummolo, S., Pecci, R., Bedini, R. Mechanical Reliability Evaluation of an Oral Implant-Abutment System According to UNI en ISO 14801 Fatigue Test Protocol Implant Dentistry, 2016, 25(5), 613–618
14. Bernardi, S., Mummolo, S., Continenza, M.A., Zeka, K., Pajewski, L. Use and Evaluation of a Cooling Aid in Laser-Assisted Dental Surgery: An Innovative Study Photomedicine and Laser Surgery, 2016, 34(6), 258–262
15. Tecco, S., Gherlone, E.F., Baldini, A., Marzo, G., Giuca, M.R. Frenulectomy of the tongue and the influence of rehabilitation exercises on the sEMG activity of masticatory muscles Journal of Electromyography and Kinesiology, 2015, 25(4), 619–628
16. Marchetti, E., Ratta, S., Mummolo, S., Pecci, R., Bedini, R. Evaluation of an endosseous oral implant system according to UNI en ISO 14801 fatigue test protocol Implant Dentistry, 2014, 23(6), 665–671
17. Bernardi, S., Mummolo, S., Marchetti, E., Macchiarelli, G., Varvara, G. Bio-morphological evaluation of periodontal ligament fibroblasts on mineralized dentin graft: An in vitro study. Journal of Biological Regulators and Homeostatic Agents, 2019, 33(1), 275–280
18. Quinzi, V., Caggiati, E., Mummolo, S., ..Tecco, S., Nota, A. Mesial rotation of the upper first molar: Association with anterior dental crowding in mixed and permanent dentition Applied Sciences Switzerland, 2020, 10(15), 5
19. Arcuri, C., Petro, E., Sollecchia, G., Mummolo, S., Marzo, G. Laser in periodontal pockets: In vivo and in vitro study Journal of Biological Regulators and Homeostatic Agents, 2020,34(3), 139–146
20. Mummolo, S., Marchetti, E., Albani, F., Campanella, V., Tecco, S. Comparison between rapid and slow palatal expansion: Evaluation of selected periodontal indices Head and Face Medicine, 2014, 10(1), 30
21. Saccomanno, S., Mummolo, S., Giancaspro, S., Quinzi, V., Mastrapasqua, R.F. Catering work profession and medico-oral health: A study on 603 subjects. Healthcare Switzerland, 2021, 9(5), 582
22. Mancini, L., Tarallo, F., Quinzi, V., Mummolo, S., Marchetti, E. Platelet-rich fibrin in single and multiple coronally advanced flap for type 1 recession: An updated systematic review and meta-analysis Medicina Lithuania, 2021, 57(2), 1–20, 144
23. Pennazza, G., Santonico, M., Mantini, G., Marzo, G., Paolesse, R. Application of a quartz microbalance based gas sensor array for the study of halitosis Journal of Breath Research, 2008, 2(1), 017009
24. Saccomanno, S., Mummolo, S., Marzo, G., Greco, F., Fiasca, F.The digital diagnostic approach to stafne's bone cavity (Sbc): From a review of the literature to the description of a clinical case. Open Dentistry Journal, 2021, 15(Special Issue),111–119
25. Memè, L., Bambini, F., Sampalmieri, F., Bianchi, A., Mummolo, S. Evaluation of a single non-surgical approach in the management of periimplantitis: glycine powder air-polishing versus ultrasonic device. Oral and Implantology, 2024, 16(2), 67–78
26. Pizzolante, T., Rasicci, P., Saggiomo, A.P., Capogreco, M., Mummolo, S. Buccal Fat Pad Flap and Buccal Advancement Flap for Closure of Oroantral Fistula: A Systematic Review and a Case Report. Oral and Implantology, 2024, 16(2),50–61
27. Grilli, F., Pizzolante, T., Capogreco, M., Bambini, F., Sampalmieri, F. Clinical and histomorphometric comparison of autologous dentin graft versus a deproteinized bovine bone graft for Socket Preservation. Oral and Implantology, 2024, 16(2), 101–106
28. Memè, L., Bambini, F., Sampalmieri, F., ... Inchingolo, F., Marricco, F. Osteonecrosis of the jaw in patients with metastatic renal carcinoma: systematic review and meta-analysis. Oral and Implantology, 2024, 16(2), 79–87
29. Pizzolante, T., Memè, L., Ciccariello, A., Bambini, F., Inchingolo, F. Complications of zygomatic implantology: observational clinical study. Bulletin of Stomatology and Maxillofacial Surgery, 2024, 20(4),73–80
30. Botticelli, G., Severino, M., Gatto, R., Franceschini, C., Di Paolo, C. Excision of lower lip mucocele using injection of hydrocolloid dental impression material in a pediatric patient: A case report. Applied Sciences Switzerland, 2021, 11(13), 5819

31. Falisi, G., Rastelli, C., Rastelli, S., ... Paolo, C.D., Franceschini, C.Ultrashort Implants, Alternative Prosthetic Rehabilitation in Mandibular Atrophies in Fragile Subjects: A Retrospective Study. Healthcare, 2021, 9(2), 1–9
32. Falisi, G., Gatto, R., Monaco, A., ... De Biase, A., Franceschini, C. A Female Psoriatic Arthritis Patient Involving the TMJ. Case Reports in Dentistry, 2021, 2021, 6638638
33. Gerardi, D., Bernardi, S., Falisi, G., Botticelli, G., Bruni, A. Characterization and morphological methods for oral biofilm visualization: where are we nowadays? Aims Microbiology, 2024, 10(2), 391–414
34. Falisi, G., Botticelli, G., Rastelli, S., Mondragon, M., Di Giacomo, P. Stabilization of the lower denture through the use of fine mini-implants: retrospective study. European Journal of Musculoskeletal Diseases, 2024, 13(2), 1–7
35. Guerra, D., Severino, M., Caruso, S., Rastelli, S., Gatto, R. The importance of using physical tridimensional models for the management and planning of extended osseous odontogenic lesions. Dentistry Journal, 2021, 9(11), 134
36. Iacomino, E., Rastelli, S., Capogreco, M., ... Gallottini, S.G., Grivetto, F. Pterygoid implants in severe posterior maxillary atrophy: a case report. Oral and Implantology, 2024, 16(2), pp. 88–94
37. Rastelli, S., Capogreco, M., D'amario, M., ... Iacomino, E., Severino, M. PTERIGOID IMPLANTS: A viable alternative for the rehabilitation of the posterior sectors of the atrophic maxilla. Oral and Implantology, 2024, 16(1), 38–43
38. Scarano, A., Bernardi, S., Rastelli, C., ... Falisi, G., Mortellaro, C. Soft tissue augmentation prior bone volume increase by means of silicon expanders: A case series. Journal of Biological Regulators and Homeostatic Agents, 2019, 33(6), 77–84
39. Mazzone, P., Padua, L., Falisi, G., ... Florio, T.M., Scarnati, E.Unilateral deep brain stimulation of the pedunculopontine tegmental nucleus improves oromotor movements in Parkinson's disease. Brain Stimulation, 2012, 5(4), 634–641
40. Bernardi, S., Botticelli, G., Marzo, G., ... Mortellaro, C., Lupi, E. Use of electrical field for biofilm implant removal. European Review for Medical and Pharmacological Sciences, 2023, 27(3),114–121
41. Rampello, A., Saccucci, M., Falisi, G., ... Polimeni, A., Di Paolo, C. A new aid in temporomandibular joint disorders' therapy: The universal neuromuscular immediate relaxing appliance. Journal of Biological Regulators and Homeostatic Agents, 2013, 27(4), 1011–1019
42. Franco, R., Lupi, E., Capogreco, M., Rosa, A. The Influence of Dental Implant Roughness on Biofilm Formation: A Comprehensive Strategy Dental Hypotheses, 2023, 14(3), 90–92
43. Di Somma, L., Iacoangeli, M., Nasi, D., ... Girotto, R., Polonara, G. Combined supra-transorbital keyhole approach for treatment of delayed intraorbital encephalocele: A minimally invasive approach for an unusual complication of decompressive craniectomy. Surgical Neurology International, 2016, 7,12–16
44. Franco, R., Lupi, E., Iacomino, E., ... Galeotti, A., Santos, J.M.M.Low-Level Laser Therapy for the Treatment of Oral Mucositis Induced by Hematopoietic Stem Cell Transplantation: A Systematic Review with Meta-Analysis. Medicina Lithuania, 2023, 59(8), 1413
45. Messi, M., Consorti, G., Lupi, E., ... Valassina, D., Balercia, P. A new operative open-wings technique to correct the frontoforehead unit in metopic synostosis Journal of Craniofacial Surgery, 2015, 26(3), 902–905
46. Singh N, Scully C, Joyston-Bechal S. Oral complications of cancer therapies: prevention and management. Clin Oncol (R Coll Radiol) 1996;8:15–24
47. American Academy of Pediatric Dentistry. Dental management of pediatric patients receiving immunosuppressive therapy and/ or head and neck radiation. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2024:545-53.
48. Nunez-Aguilar J, Oliveros-Lopez LG, Fernandez-Olavarria A, Torres-Lagares D, Serrera-Figallo MA, Gutierrez-Corrales A, Gutierrez-Perez JL. Influence of dental treatment in place on quality of life in oral cancer patients undergoing chemoradiotherapy. Med Oral Patol Oral Cir Bucal. 2018 Jul 1;23(4):e498-e505.
49. Giannattasio A, Poggi E, Migliorati M, Mondani PM, Piccardo I, Carta P, Tomarchio N, Alberti G. The efficacy of Italian guidelines in promoting oral health in children and adolescents. Eur J Paediatr Dent. 2015 Jun;16(2):93-8.
50. Ferrández-Pujante A, Pérez-Silva A, Serna-Muñoz C, Fuster-Soler JL, Galera-Miñarro AM, Cabello I, Ortiz-Ruiz AJ. Prevention and Treatment of Oral Complications in Hematologic Childhood Cancer Patients: An Update. Children (Basel). 2022 Apr 15;9(4):566.
51. Mummolo, S., Cirillo, E., Ciribè, M., Manenti, R.J., Galeotti, A. Periodontology. Part 1: Gingivitis in adolescence. Review of the literature and case reports.European Journal of Paediatric Dentistry, 2022, 23(1), 79–82
52. Marchetti, E., Pizzolante, T., Americo, L.M., ... Quinzi, V., Mummolo, S. Periodontology Part 4: Periodontal disease in children and adolescents European Journal of Paediatric Dentistry, 2022, 23(4), 332–335