COMPREHENSIVE REVIEW

A suggested universal protocol for dental examination in sports

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Abstract

The athletes of any sport and level submit their bodies to constant exercise. Any given pathology can increase the risk of injury, illness, or even reduced performance. The medical examination is valuable in diagnosing existing health problems and preventing medical issues that might compromise the athlete's overall health when exercising. The stomatognathic system is not an exemption, as oral pathologies, including dental caries and periodontal diseases, are found in high incidence in sports. The need for accurate and detailed dental examination in sports leaded dentists from the European Association for Sports Dentistry and the Academy for Sports Dentistry to elaborate a universal dental examination in sports protocol that can record the overall oral health of the athlete, including the teeth, periodontium, and musculoskeletal screening, for all athletes. The outcome of this stomatognathic examination allows sports physicians and professionals other than dentists to have a complete image of the individual oral health condition of any given athlete, and it allows the dentists to efficiently screen and prevent pathologies, as well as to advise on the eligibility to practice sports from the oral health perspective.

KEYWORDS

athletes, oral health problems, screening examination protocol, sports dentistry

1 | INTRODUCTION

Sports medicine contributes to healthier athletes and better performance and, in recent years, has evolved into a multidisciplinary field that recognizes sports dentistry as an essential element. 1,2

Sports Dentistry is the branch of dentistry dealing with the prevention and treatment of the pathologies and injuries of the oral cavity and the stomatognathic system related to sports practice.³ According to the World Health Organization, oral health is an

integral part of health, wellness, and quality of life and is a fundamental human right.⁴

Previous studies have shown that athletes' oral health is poor. Based on a systematic review, 15%-75% presented dental caries, 35%-85% erosion, and 0%-15% periodontal problems. 5,6

One of the reasons for the appearance of this high prevalence can be attributed to the diet and habits of athletes. Athletes regularly use sports, energy drinks, and carbohydrate-rich nutrients in drinks or gels during training and competition. At the same time,

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dehydration and stress caused during sports activity aggravate the effect of carbohydrates and acidic components on the dental hard tissues, reducing the protective effect of saliva.⁷

Moreover, during their activity, athletes have an increased risk of injuries to the head and mouth, especially in contact sports and martial arts. Therefore, a key component in preventing these conditions is identifying individual risk factors, pertinent information, and guidance of athletes by the dentist.

Finally, individual attitudes, behaviors, and culture toward oral health are crucial parameters for achieving oral health. Unfortunately, studies have shown that athletes' knowledge of the value of oral health and risk assessment needs to be improved. At the same time, the percentage of athletes who make regular dental visits is insignificant.

Oral health is essential for athletic performance. Poor oral hygiene and the appearance of oral diseases can cause systemic inflammation and adversely affect athletic performance. At the same time, pain, pulpitis, and inability to chew negatively affect the athlete's quality of life. Although it has yet to be fully recorded how many hours of training athletes lose during the season to deal with dental problems, the latter has a high cost on performance.

Regular oral health assessments by a dental professional, especially during the preseason, will allow for individualizing prevention plans and early treatment of any disease. National sports funders and policy organizations should take the lead in integrating such an approach. For example, the World Dental Federation (FDI) has issued the official oral health, and sports guidelines and toolkit addressed to the international community of dentists, physicians, athletes, and sports federations. 10-13 Another example is the International Olympic Committee prioritizes protecting the athlete's health, and the international sporting bodies advocate a holistic approach to ensuring athlete well-being and performance. 14

For the reasons mentioned above, the European Association for Sports Dentistry (EA4SD) and the Academy for Sports Dentistry (ASD) have created a working group to develop a Universal Screening Protocol for Dental Examinations in Sports (USPDES). This working group comprises universities, hospitals, and private practitioners from several countries with solid professional experience in sports dentistry. The athletes should submit a protocol for the dental examination before starting sports activities.

2 | THE UNIVERSAL DENTAL EXAMINATION IN SPORTS PROTOCOL

This paper results from the working group's efforts of several dentists and all members of sports dentistry associations from different countries worldwide. In the first step, the working group set the dental screening examination protocol goals.

These goals were,

- 1. The protocol to be short.
- To allow collecting a maximum of data about the overall health status of the stomatognathic system as well as to provide a shorter and faster to fill version.

- 3. Include basic information about the dental condition that will benefit the athlete and team.
- 4. To adopt the instructions and codification of the FDI.

This group commenced by listing potentially relevant topics. Next, three representatives prepared a draft protocol and presented it to the workshop plenary to obtain feedback. Finally, a list of core items was obtained for the present paper. The intensive discussions of this working group revealed a unanimous agreement about the chances and methods to be applied for this specific type of examination protocol. Still, they also revealed several difficulties and challenges hindering this application into "real life" clinical practice.

The examination protocol form is shown in Figures 1 and 2.

The green areas are the mandatory ones for filling. The rest of the areas are optional and will be filled if the dentist has enough time or the necessary equipment and place to fill them. The screening examination protocol's rationale was to have those two options (mandatory and nonmandatory) so that they could be applied universally. Additionally, the dental examination must often be performed on all the sports team members in the sports areas where there is neither the appropriate equipment nor the available time.

The first section of the examination form contains general personal and sports information (Figure 3). The athlete should fill it out, and it is mandatory.

The second section contains information on dental history (Figure 4). Again, the athlete should fill it out, and it is mandatory. Its content and structure aim to collect important epidemiological data and reveal the athletes' awareness of their oral health regarding their past dental treatments and habits. Additionally, the OHIP-5 questionnaire can be an epidemiological tool showcasing the impact of the athletes' oral health on their life, well-being, and physical exercise.

The third section includes the teeth examination (Figure 5). The dentist records caries and non-carious dental tissue lesions, measure the teeth for vitality, and proper tests for the periapical tissues. Finally, the dentist calculates the decayed, missing, and filled teeth (DMFT) index. The mandatory fields are the percussion test and the calculation of DMFT. The positive responses to the percussion test indicate inflammation of the periodontal ligament. The thermal test is used to detect the vitality of the tooth in question. Tooth and pulp testing can be done during almost any appointment to address the athlete's pain or discomfort. The thermal test, especially the cold, has good validity in distinguishing a vital pulp from a non-vital pulp, correctly identifying a large proportion of both the non-vital and vital pulps.¹⁵

On the other hand, the percussion test is a simple but beneficial examination method used to ascertain an inflammatory condition in a tooth's radicular area. It is crucial to detect these conditions early in athletes, minimizing thus the risk of developing a periodontal and periapical abscess.

For caries detection, we used the International Caries Detection and Assessment system (ICDAS) optical clinical criteria. A tooth structure's surface and optical characteristics determine the ICDAS

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Overbite		R	L	Crepitus	R	l		Masseter superficial	R	L	R	L
Max mouth opening		R	L	Compression	R	l		Masseter deep	R	L	R	L
Right laterotrusion		R	L	Endfeel	R	l		Temporalis anterior	R	L	R	L
Left laterotrusion		R	L	Deviation	n			Pterygoioid lateral	R	L	R	L
Protrusion		R	L	20		2	20	Trapezius muscles	R	L	R	L
Retrusion		R	L	R			L	Digastric	R	L	R	L
Palpation	/TMJ			20)			Sternocleidomastoid	R	L	R	L
Pain lateral		R	L	40)			Counter-resistance opening	R	L	R	L
Pain posterior		R	L	60)			Counter-resistance anterior	R	L	R	L
Pain intra-meatal		R	L					Counter-resistance lateral	R	Ĺ	R	Ĺ

RADIOGRAPHIC EXAM TAKEN (attached as annexed): panoramic__ bitewing__ other__ OCCLUSAL RECORD TAKEN: yes / no ORTHODONTIC EXAM: Angle's Class:_ Headaches present: yes / no - morning / nocturnal / during exercise

PARALYMPIC ATHLETES (filled by dentist)

(date)

_ Sensorial **Disability**: Physical_ Intellectual First appearance: Causes: Genetic_ Congenital_ Trauma_ Disease_ Activity/sport before disability: Degenerative Inferior Superior Appendage function Right Normal Reduced Absent Normal Reduced **Absent** Left Normal Reduced **Absent** Normal Reduced Absent Disease: Medications: Rehabilitation: yes / no

SPORTS DENTAL SCREENING PROTOCOL OUTCOME

YELLOW ATHLETE IS IN GROUP: GREEN

(according to the FDI guidelines: Green/no pathological and/or functional findings, Yellow/presence of at least one pathological or functional finding, Red/multiple severe pathological and/or functional findings)

ELIGIBILITY TO PRACTICE SPORTS: YES / NO

CONFIDENTIAL QUESTIONNAIRE

	1.	GENERAL IN	IFORMATIO	N (filled by athlete	e)		
FIRST NAME	LAST NAME		SEX M/F	BIRTH DATE/_	_/ \	WEIGHT	HEIGHT
ADDRESS	(street)	(number)		(city)	(PC)		(country
PHONE NUMBER	`email_			SPORT		YEARS C	F EXPERIENCE
CURRENT TEAM	COUNTRY_		DOCTOR_		D	ENTIST	

FIGURE 3 The general information section.

2. DENTAL	HISTORY (fille	ed by athlete)							
cast visit to Dentist: 0-6 months 6-12 months >1 year Dental checkups frequency: 1/year 2 or more/year <1 year dental treatments: fillings root canal extraction prosthetics surgery implant periodontal dentures orthodontic year completed. Allergies/intolerance to medications: yes / no medication: dave you ever experienced: jaw injury Yes / no specify: Diet: sodas, lollipops, sports drinks (number per day) Smoking/chew tobacco (times per day) Alcohol drinks per day AOUTHGUARDS: yes / no type: custom made prefabricated boil & bite occlusal splint: yes / no Do you wear one: always sometimes never									
How often you had the following problem during the last month?	Very often	Fairly often	Occasionally	Hardly ever	Never				
Have you had difficulty chewing any foods because of problems	•	•	•	•					
with your teeth, mouth, dentures, or jaws?									
Have you had painful aching in your mouth?									
Have you felt uncomfortable about the appearance of your									
teeth, mouth, dentures, or jaws?									
Have you felt that there has been less flavor in your food because									
of problems with your teeth, mouth, dentures, or jaws?									
Have you had difficulty doing your usual jobs because of problems									
with your teeth, mouth, dentures, or jaws?									

FIGURE 4 The dental history section.

measurements of the potential histological depth of the carious lesions. ICDAS is a simple, logical, and an evidence-based system for detecting and classifying caries in dental public health. We used the merged criteria coding 0, A, B, and C. Code O indicates sound tooth surfaces show no evidence of visible caries (no or questionable change in enamel translucency). Code A indicates initial-stage caries. First or distinct visual changes in enamel are seen as a carious opacity or visible discoloration (white spot lesion and brown carious discoloration). They show no evidence of surface breakdown or underlying dentin shadowing. Code B indicates moderate-stage caries. A white or brown spot lesion with localized enamel breakdown, without visible dentin exposure, or an underlying dentin shadow originated on the surface being evaluated. Code C indicates extensive-stage caries—a distinct cavity in opaque or discolored enamel with visible dentin.

The DMFT index is one of the most common methods in oral epidemiology for assessing dental caries prevalence and dental treatment needs among populations. ¹⁶ It is crucial to calculate this index because it shows a person's or group's caries history, especially the athletes. Therefore, we measured the code B and C ICDAS criteria (D3 threshold) to calculate the D parameter. This form uses the Eden Baysal Dental Trauma Index (EBDTI) for recording tooth trauma. ¹⁷ This index is simple to use in emergencies and facilitates later data processing. Also, it gives the possibility to record several different clinical scenarios. By correctly diagnosing the affected tissues, adequate treatment can be chosen according to the guidelines of the International Association of Dental Traumatology and the Dental

Trauma Guide from alternatives already in the emergency situation. Moreover, the index is suitable for electronic data collection and provides easy handling. 18,19 Previous studies showed that this index was successfully validated for face and content. The Eden Baysal Dental Trauma Index is a five-digit index that defines the type of injury of the dental hard tissues (crown in relation to the pulp and root), periodontal ligament, and alveolar process, and it also records the maturity of the root apex. The FDI tooth code should be used in parentheses to indicate the injured tooth. The first digit after the FDI tooth code stands for hard dental tissue injuries affecting the crown with information on its relationship to the pulp and root (0=none, 1=enamel fracture, 2=enamel and dentin fracture=uncomplicated crown fracture, 3 = enamel and dentin fracture including the pulp=complicated crown fracture, 4=enamel-dentin-cementum fracture=uncomplicated crown-root fracture, 5=enamel-dentincementum fracture including the pulp=complicated crown-root fracture). The second digit stands for hard dental tissue injury of the root indicating the location of the fracture line (0=none, 1=apical one-third root fracture, 2=middle one-third root fracture, 3=cervical one-third root fracture). The third digit stands for periodontal ligament injury. The type of the periodontal ligament injury that is present is indicated by its first letter written in capitals (N=none, C=concussion, S=subluxation, E=extrusive luxation, L=lateral luxation, I=intrusive luxation, A=avulsion). The fourth digit stands for the maturity of the apex. Lower case first letters of the words defining the characteristics of the apex are used (i=immature apex, m=mature apex, r=resorbed apex). The fifth digit indicates

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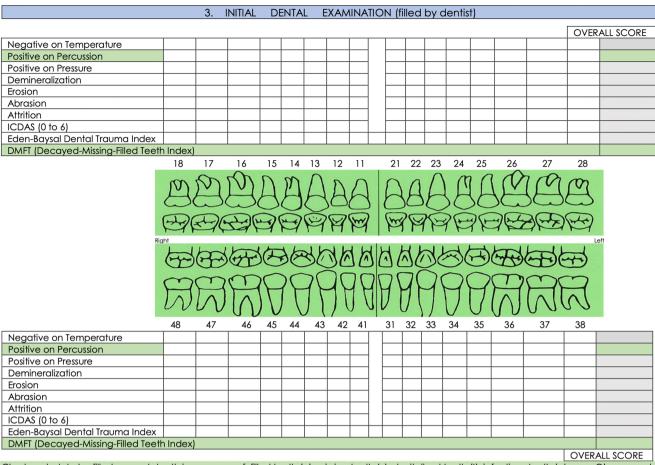


Chart symbols to be filled on each tooth in presence of: filled teeth (*), missing teeth (x), devitalized teeth (I), infectious teeth (abscess O), crowned teeth (prosthetics U), cracked teeth (/)

FIGURE 5 The dental examination section.

the presence or absence of a fracture of the alveolar process and is expressed by a plus (+) or minus (-) sign, respectively (plus sign (+)=presence of a fracture of the alveolar process and minus sign (-)=no detectable alveolar process fracture).

The fourth section filled by the dentist is the periodontal screening, saliva, and mucosa examination (Figure 6). In this section, the dentist calculates the bleeding on the probing (BOP) index, the plaque (PI) and gingival index (GI), the recession, the tooth mobility, the clinical attachment loss (CAL), and probing pocket depth (PPD). First, the essential periodontal examination is a screening tool to enable practitioners to determine whether their patient has significant periodontal disease. The mandatory fields are the BOP and GI index, mobility, and diagnosis of periodontitis (marked as P) or gingivitis (marked as G). This examination should screen all new athletes and those without a periodontal examination in the past year. Both active gingivitis and periodontitis can be said to occur if bleeding is present. The GI records gingival inflammation in three grades. It is measured on six selected teeth (16, 12, 24 and 36, 32, 44) on facial, oral, mesial, and distal sites. This measurement is based on the presence or absence of bleeding on gentle probing. The BOP from the base of the pocket indicates the disease activity at a site at a particular time. These simple indices require no special equipment or conditions. ¹⁶ Afterward, the dentist diagnoses periodontal status correctly based on the above calculations.

Regarding the mucosa, dentists can examine for lesions in the palate, lips, tongue, throat/neck, and cheeks, marking their results as normal or abnormal and, if necessary, adding their notes.

The saliva test was performed in two steps. ²⁰ Assessment of the pH of resting saliva. One end of the pH strip provided was placed into the buccal mucosa for 10s before comparing it to the color chart on the saliva pH meter strip. The highly acidic saliva (pH=5.0-5.8) is represented by the red section, moderately acidic (pH=6.0-6.6) is represented by yellow and healthy saliva (pH=6.8-7.8) is represented by green. The quantity of the stimulated saliva measures the saliva flow. The dentist requires the patient to chew on a piece of paraffin wax for 30s and expectorate into the measuring cup, then continue chewing for 5 min and expectorating after every 15–20s. The volume of liquid in the cup, excluding froth, is measured and recorded. Volumes less than $3.5\,\text{mL}$ are considered very low stimulated saliva production, $3.5-5.0\,\text{mL}$ are considered low, and more significant than $5.0\,\text{mL}$ are considered normal.

The fifth section is dedicated to musculoskeletal screening, which the dentist will fill out (Figure 7).

Oral Cancer Screen	Normal	Abnormal	Notes
Palate			
Lips			
Tongue			
Throat/neck			
Cheeks			

Floor of mouth	Normal	Abnormal	Notes					
Fraenum								
Saliva	pH:		Flow: ml/min					
Diagnosis	Р	G	Periodontitis (P) / Gingivitis (G)					

FIGURE 6 The periodontal, mucosa, and saliva screening section.

5. MUSCULOSKELETAL SCREENING (filled by dentist) Reported pain in the face and/or temples: yes / no, TMJ noise: yes / no, Mandibular movement limitations: yes / no, Pain on muscle palpation: yes / no, Pain on TMJ palpation: yes / no Functional analysis____ Asymmetry ____ Opening/Closing of the mouth ____ Deviation (mm) ____

Limited mouvement			Locking R L				Muscles					
	mm	Devi	ation	Clicking	R	L			Po	nin	Ter	nsion
Overbite		R	L	Crepitus	R	L		Masseter superficial	R	L	R	L
Max mouth opening		R	L	Compression	R	L		Masseter deep	R	L	R	L
Right laterotrusion		R	L	Endfeel	R	L		Temporalis anterior	R	L	R	L
Left laterotrusion	,	R	L	Deviation			Pterygoioid lateral		L	R	L	
Protrusion		R	L	20 20		20		Trapezius muscles		L	R	L
Retrusion		R	L	R		L	1	Digastric	R	L	R	L
Palpation	/TMJ			20				Sternocleidomastoid	R	L	R	L
Pain lateral		R	L	40				Counter-resistance opening	R	L	R	L
Pain posterior		R	L	60				Counter-resistance anterior	R	L	R	L
Pain intra-meatal		R	L					Counter-resistance lateral	R	L	R	L

RADIOGRAPHIC EXAM TAKEN (attached as annexed): panoramic__ retroalveolar__ CBCT__ OCCLUSAL RECORD TAKEN: yes / no ORTHODONTIC EXAM: Angle's Class:____ Headaches present: yes / no - morning / nocturnal / during exercise

 $\label{figure} \textbf{FIGURE 7} \quad \text{The musculoskeletal screening section}.$

The dental occlusion and the temporomandibular joint's function (TMJ) significantly impact the physiology and health of the stomatognathic system. The latter influences the body's function and physical exercise, injury risk, and performance of athletes. ²¹ When studying the field of functional neurology in sports and its prevention, the stomatognathic system is a part of the nervous system that might affect athletes' posture, strength, and coordination. With the

cooperation between sports dentistry and medicine, sports dentists will diagnose and treat defective dental occlusion and temporomandibular disorders to benefit athletes' oral and overall health. In this section, if available, the dentist records the findings from x-ray examinations and occlusal records. Finally, they record the orthodontic Angle's class to detect the predisposition to trauma (especially in the cases of incisal overjets), the use or not of sports mouthguards, and

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the type. Temporomandibular disorder (TMD) is a collective term for structural and functional diseases involving the temporomandibular joint and masticatory muscles, head and neck muscles, and contiguous tissue components.²² Biological, anatomical, biomechanical, behavioral, environmental, and emotional factors influence the masticatory system, contributing to the development of signs and symptoms of TMD, which, however, are considered a multifactorial pathology characterized mainly by pain and reduced movement of the iaw.²³

Functional changes in the masticatory muscles are the most frequent patient reports. As the alterations of the masticatory muscles resolve relatively quickly, they are considered acute myalgic forms.²³

Dysfunctions of the temporomandibular joints are the most frequent findings upon examination of a patient with dysfunctions of the chewing system. Some of these do not cause pain and can be misalignment of the condyle-disc complex, structural incompatibility of the articular surfaces, or articular inflammatory changes.

A group of basic and clinical pain sciences experts modified the revised Axis I Research Diagnostic Criteria for Temporomandibular Disorders RDC/TMD algorithms by conducting in-depth searches of the diagnostic literature, followed by review and consensus through a formal structured process.²⁴ The Committee's recommendations for further revision of the Axis I diagnostic algorithms were assessed for validity using the validation project dataset and for reliability using newly collected data as part of the ongoing ATM Impacts project.

The Axis I diagnostic criteria protocol for TMD (RDC/TMD) includes both a valid scheme to detect any pain-related TMD and valid diagnostic criteria to differentiate the most common pain-related TMD (sensitivity ≥0.86, specificity ≥0.98) and for an intra-articular disorder (sensitivity 0.80 and specificity 0.97). Diagnostic criteria for other common intra-articular diseases are not valid enough for clinical diagnosis but can be used for screening.

The section of the folder relating to functional screening is a compact and essential version of the diagnostic criteria, relating to

Axis I, aimed at detecting the main factors of nonphysiological function and directing to an in-depth diagnostic study.

The sixth section includes information about paralympic athletes. Again, the dentist fills this section. (Figure 8).

The seventh section refers to the conclusion from all the examinations and the final judgment on oral-facial conditions (Figure 9). We follow the guidelines of FDI and classify the athletes into three categories. 10-13 The first category is green. The athlete presents no pathological or functional findings. The second category is yellow. The athlete presents at least one pathological or functional finding; the last category is red.⁹ That means the athlete presents multiple severe pathological and functional findings. One of the innovations this protocol introduces is that the dentist completing this examination can decide upon the athlete's eligibility to practice sports based on the objective findings and the overall oral health. This section is mandatory.

3 **DISCUSSION**

European Association for Sports Dentistry and Academy for Sports Dentistry are firmly committed to developing sports dentistry and its integration into sports medicine as they have decided to sign the European Association for Sports Dentistry and Academy for Sports Dentistry Memorandum of Understanding (MoU) in 2019.² Until now, there was no standard system for examining and recording athletes' dental problems. While the sports examination is integral to the athlete's participation in sports activities unreservedly, the same is not the case with the dental examination. A well-known example of a medical examination of athletes in sports is Pre-Competition Medical Assessment (PCMA), created by the Federation Internationale des Federations du Football (FIFA).²⁵ The sports dentistry examination protocol aims to create standard conditions for the dental examination of athletes to be part of the general medical examination. Its philosophy is to provide a simple, fast, and easy way to complete

	6. PA	ARALYMPIC A	THLETES (filled	by dentist)					
Disability: Physical Sensorial Intellectual First appearance: (date)									
Causes: Genetic Congenital T	rauma Dis	ease Deg	generative	Activity/sp	ort before dis	ability:			
			Superior			Inferior			
Appendage function	Right	Normal	Reduced	Absent	Normal	Reduced	Absent		
	Left	Normal	Reduced	Absent	Normal	Reduced	Absent		
Disease:	Medication	ns:			_ Rehabilita	tion: yes / no			

FIGURE 8 The section for paralympic athletes' information.

SPORTS DENTAL SCREENING PROTOCOL OUTCOME

ATHLETE IS IN GROUP: GREEN

(according to the FDI guidelines: Green/no pathological and/or functional findings, Yellow/presence of at least one pathological or functional finding, Red/multiple severe pathological and/or functional findings)

ELIGIBILITY TO PRACTICE SPORTS: YES / NO

mandatory fields without special medical equipment. At the same time, however, it allows for a more detailed examination when conditions, time, and specialized equipment allow it.

It also records the main dental conditions and diseases that may, in the future, pose obstacles to the exercise of sports activities. In addition, the goal was to be a standard form for all dentists involved in sports dentistry. For example, if an athlete is currently on a team in one country and goes to another team in another country, this dental protocol will follow, and there will be a common ground.

Another goal of creating this examination protocol is to record the existing dental problems of athletes, inform and raise their awareness, motivate them, and develop individualized preventive and therapeutic protocols. Therefore, after examining the athletes and their final ranking based on their problems and needs, the next step is to design appropriate preventive programs that will be applied according to the athlete's oral-facial situation ranking. Oral diseases such as caries, tooth wear, and periodontal diseases do not present with severe pain in their early stages, and athletes continue to train and compete, even with symptoms. ²⁶ On the other side, it is crucial to establish appropriate services to manage athletes' oral health continuously and not only during significant competitions

The short extent of this protocol in two pages can be ideal for integrating it into sports medicine examination protocols as an annex. The examination is done by the simple answer to questions, in majority yes or no, filling numbers (digits), and overall scores in numbers (digits) that make it easy to establish an overall oral health score. This, in turn, can be easily interpreted by non-dentists in sports, such as sports physicians and physiotherapists, to understand the oral health condition of the athlete.

It is now desirable to integrate sports dentistry into the sports medicine multidisciplinary field. Sports dentistry has recently been recognized as a new field in dentistry by the FDI. There is a complex two-way interaction between oral health and sports activities. Oral diseases can influence physical exercise outcomes, risk of injury, and performance. Conversely, physical exercise is a risk factor for initiating or aggravating oral diseases because of stress, diet, salivary flow, absence of oral health prevention, and protection against orofacial injuries.

Screening/early recognition of the disease is well-established in health care. Therefore, there is a pressing need for early dental screening examination of athletes to promote oral health and prevention and raise awareness of oral health's importance in sports within the athletic community, health professionals, sports federations, and medical centers.

AUTHOR CONTRIBUTIONS

Conceptualization, AS, MD, CR; methodology, all authors; software, AS, CR; formal analysis, all authors; data curation, all authors; writing—original draft preparation, AS, MD, CR; writing—review and editing, all authors; supervision, AS, CR; All authors have read and agreed to the published version of the manuscript.

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The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data supporting this study's findings are available from the corresponding author upon reasonable request.

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