

Tooth Wear (Pathological or Physiological)

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Summary:

Tooth wear can be defined as loss of tooth surface due to attrition, abrasion or erosion. It can mainly be divided into two groups (pathological and physiological). Many patients and clinicians deal with this process, If not controlled or detected in early stages it can elevate fast and due to its irreversibility treatments are concluded in prosthetic protocols. Main key factor in this process is prevention, monitoring and management. Each individual can has its own version of worn teeth, due to that our methods of approach will be different in every case.

Keywords: tooth wear, dentition, attrition, abrasion, erosion, TMJ, examination, saliva, dehydration, pathological, physiological

Introduction:

Loss of hard tissue of the teeth surface due to physiological factor or pathological, it's not concluded as trauma, caries tooth surface loss or any developmental disorders. These complications can be caused by different factors such as para-functional movements of the mouth, bruxism or malocclusion. With aging in each individual, these tooth wear will increase by passing time, it can be called the nature of our body. In this case we are not talking about carious lesion tooth loss, it simply a physiological matter by passing time.

Tooth wear can be classified in 3 main types but basically all these factor work as group in this process: Attrition: Surface loss due to tooth by tooth contact, due to malocclusion or para-functional habits such as bruxism that leads to attrition. Severity of the matter can be assessed by how much this movements continues. Some para-functional habits can be managed easily by a special mouth guard or retainers. Basically any event that can cause excessive stress between the Tooth Contact Surface can cause attrition, these factors can be TMJ problems, occlusion plan disturbance or malocclusion. (fig.1)

Abrasion: Surface loss due foreign object contact with the tooth, such as food or tooth brush (using tooth brush and toothpaste has direct impact on this factor, excessive use of it can cause a tooth wear due to hard bristles of the brush). also dietary system of the individual can also cause abrasion not because of the acidic factors or nutritional (that counts as erosion)

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კბილის ცვეთა განისაზღვრება, როგორც კბილის ქსოვილის დაკარგვა გაცვეთის, აბრაზიის ან ეროზიის მიზეზით. კბილის ცვეთა შიძლება დაიყოს 2 ჯგუფად (პათოლოგიური და ფიზიოლოგიური). უამრავი პრაქტიკოსი და კლინიცისტი ექიმი ხვდება თავის პრაქტიკაში ამ პროცესს. თუ მისი კონტროლი ნაადრევ სტადიაზე არ მოხდება, ის შეიძლება სწრაფად განვითარდეს და, იქიდან გამომდინარე, რომ წარმოადგენს შეუქცევად პროცესს, განიხილება ორთოპედიული მკურნალობის პროტოკოლებში. მთავარ ფაქტორს ამ პათოლოგიისათვის წარმოადგენს პროფილაქტიკა, მონიტორინგი და მენეჯმენტი. კბილის ცვეთა ინდივიდუალური ხარისხით შეიძლება იქნეს აღმოჩენილი თითოეულ პაციენტში, შესაბამისად მკურნალობის მეთოდი თითოეული შემთხვევისათვის ინდივიდუალურად იქნება შედგენილი.

საკვანძო სიტყვები: კბილის გაცვეთა, აბრაზია, ეროზია, საფეთქელ-ყბის სახსარი, გამოკვლევა, ნერწყვი, დეჰიდრატაცია, პათოლოგიური, ფიზიოლოგიური

შესავალი:

კბილის ზედაპირის მაგარი ქსოვილების დაკარგვა, ფიზიოლოგიური თუ პათოლოგიური ფაქტორებით განპირობებული, ყოველთვის არ განიხილება როგორც ტრავმა, კარიესი ანდა განვითარების რომელიმე დარღვევა. ეს გართულებები შეიძლება გამოწვეული იყოს ისეთი განსხვავებული ფაქტორებით, როგორცაა პირის პარაფუნქციური მოძრაობა, ბრუქსიზმი ან თანკბილვის პათოლოგია. ყოველ ინდივიდში, ასაკთან ერთად, კბილის ცვეთა დროსთან ერთად იზრდება და განიხილება ჩვენი სხეულის ბუნებრივ მოვლენად. ამ შემთხვევაში არ განვიხილავთ კარიესს, არამედ - დროსთან დაკავშირებულ ფიზიოლოგიურ მოვლენას.

but for hardness of the food they chose in their daily life for example use a lots of nuts or biting on hard material food. (fig.2)

Erosion: surface loss of the tooth by non-bacteriogenic acid Erosion is described exclusively as a surface phenomenon, differs from caries in which there is destruction of both the surface and the subsurface areas of the human teeth .studies showed that dietary acids are considered to be the main cause of erosion. [1, 2, 3] (fig.3)

(Abfraction: due to any complication (attrition, erosion, abrasion) leads to fracture of the tooth at marginal area (gingival margin).located in both dentin and enamel.V shape like ,wedge like near cemento-enamel junction) (fig.4)

The international between erosion,abrasion and attrition highlight a multifactorial process that create a worn dentition, in individual there is different variation of involvement of every each one of these factor. In some cases the main cause can be erosion and due to that abrasion and attrition take part in this process and cause more severity but also that being said others can be the main cause but generally we cannot differentiate between the absolute causes after the tooth got worn, the goal is here to diagnose, prevent and manage. [4]

There can be another type of tooth wear but it cannot appear as main factor:Tooth wear due to contact with a restoration: when the natural teeth get contact with artificial crown or any restoration due to the design there can be a level of excessive attrition between these two surfaces, even though restoration can be perfectly designed, still can be flaws in it and cause the excessive contact in between. As all we know, natural teeth is always the best choice but sometimes because of some complication we lose them so we have to compromise. Some studies showed that fedspatic material will cause more tooth wear due to their toughness,but zirconia is more promising,because it cause less tooth wear, more bio-compatible, more flexible [4].

Main causative factor of tooth erosion is lack of oral environmental protection, which is connected with saliva, it's components, amount and flow rate. Our saliva play's a big role in the protection of the mouth. Saliva is central in counteracting and balancing tooth wear processes, and tooth surfaces are protected against tooth wear by salivary buffering capacity, salivary pellicle, acid clearance and washing of the dentition.

The flow of the saliva has direct connection to the erosion. Both saliva serous and mucous protect the teeth with lubrication through attritional wear and tooth inner contact with each other and helping with neutralizing the acids .due to its content (calcium and phosphate) saliva reduces the demineralization. So

saliva flow it's a crucial factor to prevent tooth wear in the dentition.[5, 6]

Numerous protective mechanisms interact to maintain the healthy environment of the oral cavity. Both soft and hard tissues have to be protected against microbial challenge. The first line of defense called the saliva. The role of saliva is ambivalent: although it has numerous protective antimicrobial properties, pellicle formation results in the attachment of microorganisms with the help of saliva, and it may play a role in the development of calculus through the precipitation of soluble minerals, and saliva also serves as nutrient for some microbes. Saliva plays an important role in the protection against microorganisms, maintains healthy oral environment, digestion and bolus formation. [7]

As we point out earlier that tooth wear can be multifactorial process, and there are many factors to provoke this process take place. Dehydration is one of those factors that has direct connection with the erosion. It's to be known that saliva's role is a key factor in prevention of the erosion.So, due to the dehydration minor and major glands that responsible for the production of the saliva won't work properly so the flow rate of saliva will reduces excessively and cause perfect environment for development of the erosion. For example in one case present an elite athlete,in his mid 20's because of his life style he exposed himself to severe tooth wear. Due to his rigorous training regimes reduced the salivary protection of his dentition. Subsequent rehydration with acidic sports drink at the time of dehydration affected his dentition severely.[8]

After eruption of the tooth it goes through several stages. The latest one is attrition, which can be discussed as a physiological tooth wear. [9]. Physiological wear causing vertical loss of enamel in a normal individual is approximately 0.02-0.04 mm per year and wear is considered excessive when it causes esthetic concerns to the patient and causes symptoms of discomfort. Once the amount of tooth wear becomes so severe that recurrent symptoms are caused, then it is deemed 'pathological' tooth surface loss and becomes a challenge for a restorative dentist. Key point is that we can determine that the attrition is physiological or pathological that we can assess the situation and try to prevent further reduction. The goal is to prevent not to cure because there is no available substitute except restorative methods or prosthetic.

Saliva can lessen the tooth wear processes via pellicle formation and re-mineralization; however, cannot prevent it. Early diagnostic is main key in tooth wear because if find out that this process is taking action in the dentition, then we can focus on the roots of the problem, find which factor is the main cause (attrition, erosion or abrasion) and after illustrating the situation

and finding the main cause then we can start prevention process by changing the dietary habits in case of erosion, fixing malocclusion or para-functional habits, to prevent these cases to reach at the severe level. [10]

Extra-oral and intraoral examination:

In the examination many things can show us that tooth wear is in process, so we can start prevention planning and management of the matter in hand. Much can be learned from the lifestyle of the individual, general medication, temporomandibular joints (TMJ) disorders and oral glands pathology. These assessments can add more information about the case for the clinician to know better about the patient status. Intraoral and extra-oral examination is crucial for the patient and the clinician because we can point out the tooth wear process in the dentition before it reaches to the critical point. Factors such as glands dysfunction, TMJ disorders and occlusion problems can be seen in the dentition or the oral cavity and with spotting these complication we can assess the severity of the problem and predict the future outcome [11, 12].

Imaging: medical images can help us a lot in our diagnostic significantly, with more accuracy determine the level of worn tooth, OCT (optical coherence tomography) can be a good example in this matter [13, 14].

Management and treatment:

The key to perfect treatment in tooth wear is early detection, if us dentists be able to detect the worn teeth in early stages, there is high chance that the teeth can be saved. Preventing the case to become less severe is always better than treatment, as earlier we point out, the goal is to diagnose, prevent and manage. Sometimes due to lack of information or not paying enough attention, the signs will get missed and the worn dentition reach it critical point, in this point of time the level of the tooth surface reduction can determine the future treatment, generally the related treatment to this matter is dental restorations (prosthesis) such as crowns (fully or partially). Due to the nature of the tooth wear, we lose surface of the teeth so if the reduction reach the severe stages, basically when that happen we don't have enough structure to apply any kind of restoration so we have to do built up process such as post and core and the following that by prosthesis restoration. [15]

Discussion:

Its nature for the dentition to lose surface through time, like any other organs in the body, the tooth also get weakened by time. Detection of this process can help us a lot to prevent the severe reduction of the structure of the dentition. Tooth wear starts with physiological stage and work its way up to pathological stage. This

process, as we mentioned above, is multifactorial (occlusion, habits, saliva components and flow, diet, TMJ disorders and so on) and the best way to avoid complicated results, is the prevention harmful influence of these factors. If we can control this process from physiological to pathological we have a great chance to eliminate it before it reaches a point that it's too late. Our key goal must be to early diagnose and detection if the tooth wear process is progressing or not, then create a plan for the dentition to reduce harmful factors and last part is monitoring the process through the life.

Conclusion:

Tooth wear process takes time to reach it maximum capacity so due to that we are able to detect and diagnose this activity. Accuracy of this matter can determine in future can it be controlled or it already reached it destructive level. With efficient examination (extra-oral and intraoral) and imaging it's possible to determine severity and predict outcome. With some simple adjustment to the patient life, the dentition can be saved. Cooperation of the patient and the clinician is the main key factor for the treatment process.

Result:



Figure 1: Model that shows tooth wear (abrasion, erosion, attrition) in Incisial surface of the anterior teeth.



Figure 2: Excessive tooth wear (abrasion, attrition, erosion) cause severe tooth reduction.



Figure 3: Depth of the tooth wear from occlusal view.

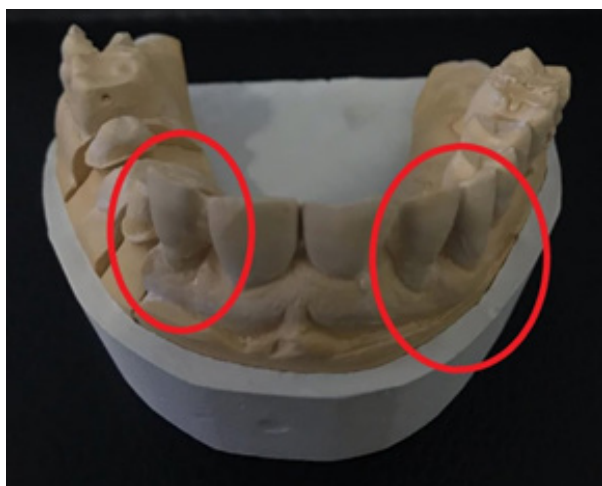


Figure 4: Circled area shows the ab-fraction process in place.

Acknowledgment:

1. We thank DR LALI KAVTAEADZE (lalika-vteadze clinic placed in Tbilisi ,Georgia) for providing us with the models and cases of the tooth wear that helps us through this article for better understanding and assessment.
2. We thank The University of Georgia for creating the opportunity for us to apply our article under their flag. We are deeply honored.
3. We thank DR MAIA JIKIA (our head of Academic department)for reviewing and revise our article , for the better assessments. It was a pleasure working with her.
4. I want to thank my supervisor DR KetevanNanobashvili, she helped me through all the process. I am honored to work by her side in this project.

References:

1. Tooth wear, ABC the worn dentition – FARID KHAN, W.G. YOUNG. Page (1-20).
2. Contemporary fixed prosthetic – fujimato ,land, rosenstiel . fourth edition (111-136).
3. Tooth surface loss revisited: Classification, etiology, and management ,Ayesha Hanif, Haroon

- Rashid, Mustafa Nasim (<http://www.jresdent.org/article.asp?issn=2321-4619;year=2015;volume=3;issue=2;spage=37;epage=43;aulas>).
4. Tooth surface loss revisited: Classification, etiology, and management ,Ayesha Hanif, Haroon Rashid, Mustafa Nasim (<http://www.jresdent.org/article.asp?issn=2321-4619;year=2015;volume=3;issue=2;spage=37;epage=43;aulas>).
5. Tooth wear, ABC the worn dentition – FARID KHAN, W.G. YOUNG. Page (1-20).
6. Contemporary fixed prosthetic – fujimato ,land, rosenstiel . fourth edition (431-435).
7. Handbook of Dental Hygienist” – Handbook of BSc level Dental Hygienist Program page (44-46)
8. Tooth wear, ABC the worn dentition – FARID KHAN, W.G. YOUNG. Page (1-20).
9. Pinkham and avery’s. Pediatric Dentistry. Elsevier Saunders 2005. page(198).
10. Tooth surface loss revisited: Classification, etiology, and management ,Ayesha Hanif, Haroon Rashid, Mustafa Nasim (<http://www.jresdent.org/article.asp?issn=2321-4619;year=2015;volume=3;issue=2;spage=37;epage=43;aulas>).
11. Tooth wear, ABC the worn dentition – FARID KHAN, W.G. YOUNG. Page (1-20).
12. Contemporary fixed prosthetic – fujimato ,land, rosenstiel . fourth edition (4-40).
13. En face optical coherence tomography investigation of pathological dental wear EnikoStoica Corina Marcauteanu, BratuDorin, MedaNegruti-u,Sinescu Cosmin, Topala Florin, Goguta Luciana, Michael Hughes, Adrian Bradu , George Dobre, Adrian Gh. Podoleanu (http://www.tmj.ro/pdf/2010_number_1_8948541128540.pdf).
14. Quantitative evaluation of dental abfraction and attrition using a swept-source optical coherence tomography system - Corina Marcauteanu; Adrian Bradu; Cosmin Sinescu D.D.S.; Florin I. Topala; Neda L. Negrutiu; Adrian Gh. Podoleanu (<https://www.spiedigitallibrary.org/journals/Journal-of-Biomedical-Optics/volume-19/issue-2/021108/Quantitative-evaluation-of-dental-abfraction-and-attrition-using-a-swept/10.1117/1.JBO.19.2.021108.full?S-SO=1>).
15. Long-term Survival of Direct and Indirect RestorationsPlaced for the Treatment of Advanced Tooth Wear Roger J. Smales and Thomas L. Berekally (<https://hodsollhousedental.co.uk/wp-content/uploads/2014/10/Smales-and-Berekally-2007-TSL-restoration-survival-21.pdf>).