

The quantification of dental trauma in clinical medical-legal practice. *An update*

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Abstract: Dental trauma is very frequent in clinical legal medicine practice and, even if it usually has a low severity it often poses difficult problems for the legal medicine specialist. It is the case of evaluating the severity of the injuries in order to assess the judicial implications. In 2002 we have published a grading methodology for evaluating the severity of trauma lesions in oro-maxillo-facial, OMF, pathology. However, due to recent advances in the field this grading methodology is in need for an update, especially regarding dental lesions, which is the purpose of this article. This update will be useful for both medical-legal and for dental physicians, which will have an updated tool to quantify the severity of OMF lesions. The article analyses the number of medical care days for dental dislocation, fractures and dental implants. Additionally authors presents some clinical legal medicine issues when evaluating the dental implants.

Key Words: dental trauma, care days, dental dislocation, dental fractures, dental implants

Dental trauma is very frequent in medical-legal practice and, even if it usually has a low severity it often poses difficult problems for the medical-legal physician. In 2002 we have published a grading methodology for evaluating the severity of trauma lesions in oro-maxillo-facial pathology [1]. However, due to recent advances in the field this grading methodology is in need for an update, especially regarding dental lesions, which is the purpose of this article. This update will be useful for both medical-legal and for dental physicians, which will have an updated tool to quantify the

severity of OMF lesions. "Medical care period of time", MCPT, is a score ready to assess the severity of the trauma from a judicial perspective not only in dental trauma but all kind of trauma.

The penal code refers to different situations that results from assigning the MCPT as mild injuries in "blunt injuries and some other violent trauma", medium injuries in "body injuries" case and finally, severe injuries in "severe body injuries". A score is determined which is normally close related to the medical care period of time as a guiding criteria but sometimes quite different: (1) there may be cases

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when little medical care (low score MCPT) is served to the patient but a higher clinical severity is involved (i.e. face bone fractures, epistaxis, etc.) or (2) a lot of medical care is offered despite low score of the MCPT (i.e. facial reconstructions, dental implants, etc.).

Dental dislocation.

Dental dislocation is defined by the presence of an abnormal dental mobility. A dental dislocation get a MCPT evaluating score if it has obvious traumatic causes (some other possible medical causes are occlusal overtraining or periodontitis – gum disease-).

In dental contusions the treatment is represented by surveillance for possible mortification (usually this occurs less than 48 hours after trauma); if mortification is identified the affected teeth is treated with denervation or endodontic treatment.

Vitality tests (for mortification) may be inconclusive in the first hours because a concussed tooth may have a false lack of vitality (some kind of a stupor state, vascular mediated); therefore these tests should be repeated.

In subtotal and total dislocations the neuro and vascular bundle may be affected. In these cases the pulp must be removed and the management protocol must include endodontic treatment followed by arcade repositioning and immobilization, which is kept for 4-6 weeks.

In avulsions the tooth is not present in the dental alveoli; if however it was recovered from the scene the treatment should include implantation, followed by endodontic treatment and immobilization for 4-6 weeks.

The number of MCPTs depends on the type of dislocation (0 days MCPTs for dental contusion, 10-14 days MCPTs for subluxation, dislocation with intrusion, dislocation with extrusion, lateral dislocation, dental avulsion if the tooth is replanted). There is no connection between MCPT and number of affected teeth. What is needed for one teeth is needed for 2 or 3 or 5 also: usually the treatments are most similar and done in same stages altogether. If however the teeth are temporary immobilized with wires the number of MCPTs is increased to 20 days because the wires must be kept for four to six weeks; this period of time is again independent upon the number of affected teeth and the type of lesion (i.e. contusion, dislocation or avulsion) and it represents the time needed for the formation of an anchylosis (the transformation of the normal cofosis

in anchylosis).

If however the fixation has not occurred the teeth must be extracted after 4-6 weeks and a prosthetic implant must be used for restoration. The restoration adds 14-17 ZIMs if all teeth are on the same dental arch and about 30 MCPTs if the teeth are on different dental arches. In dental avulsion a bridge is used, either partially or totally physiognomic, applied on a metal back-bone. These bridges are usually made in about 14 days, while the patient is in the period after maxilla preparation; the score number of MCPTs should not be dependent upon the material from which the bridge is made from. The finished prosthetic work is put after another 3 days; therefore the number of MCPTs should be if everything goes well somewhere between 14 and 17 days. This value is significantly increased if both dental arches are trauma injured or gum diseases are overimposed as they cannot be treated in the same time.

Dental fractures.

According to the WHO[2], dental fractures can be classified in:

- fractures of enamel of tooth; dental pulp is not interested, and the treatment is represented by coronal restoration
- fracture of crown without pulp involvement; the treatment is represented by coronal restoration
- fracture of crown with pulpal involvement; treatment is represented by nerve removal and coronal restoration.
- Fracture of the neck; treatment is represented by nerve removal, endodontic treatment, crown-root restoration and crown.
- Fracture of root of the tooth. Depending upon the position the treatment is represented: (1) if the fracture is located in the upper third, by nerve removal, gum and alveolar plasty, coronal-root reconstruction and crown; (2) if the fracture is located in the middle third, by nerve removal, gathering the fragments with a metallic or plastic pin, endodontic treatment or, if not possible, dental extraction; and (3) if the fracture is located in the lower third, by apical resection or dental extraction. The total number of MCPTs can theoretically be computed by assigning a number of MCPTs to each procedure (e.g. one day for endodontic treatment, two for the pivot, three for the crown), or by using a mean value. The latter is proffered by us as it is often difficult to quantify all procedures used in a

restoration and as some procedures may overlap.

As a general rule, the number of MCPTs in dental fractures should be: 5 for crown fractures (and up to 15 if complications occur), 10 days for neck fractures and 10-12 days for root fractures.

If the root remains in place reconstruction may be usually done using a hinge plus crown. Its construction needs about seven days (up to ten if porcelain is used). This is the reason the number of MCPTs has a mean value of 10. In cases of deterioration of prosthesis MCPTs are only granted for associated traumatic lesions (like gum wound, neighboring teeth, etc); MCPTs are never granted for the reconstruction of altered prosthesis nor for the augmentation of a definitive prosthesis. The dental state is documented in a certificate and this incident must be noted and correlated (or not) with the declared traumatic event, in order to protect the dental physician from potential malpractice claims.

Dental implants.

Dental implantology consists of a series of medical interventions: anesthesia, dental extraction, creating bone site where the implant will reside in, implant insertion, testing the health of the adjacent tissue, implant loading throughout definitive prosthetic reconstruction.

Medical indications for dental implants are: (1) general (healthy patients with functional occlusion), (2) local (which are taking into consideration the anatomical characteristics of the implanted area, the structural type of the bone, the type and quality of the implant, the surgical technique and the future prosthetic reconstruction).

Contraindications for dental implants are: age less than 21, metabolic disorders, systemic disease, neoplastic, chronic nephritis, taking the following medications - steroids, anticoagulants, biphosphonates, chemotherapy, radiation therapy, hemodialysis -, smoking more than 10 cigarettes a day, pregnant, significant periodontal diseases, bruxism, poor oral hygiene habits, ulcerations, temporal-mandibular joint disorders, etc. If a patient is not eligible the number of days needed for a successful implant often increases and there is an increased risk for implant reject [3-12].

The patients undergoing dental implants should be monitored for all the period starting with the insertion of the implant. Patients monitoring can be subdivided into: (1) monitoring during the period of primary tissue integration until the implant is

loaded with a temporary prosthesis; (2) monitoring between the loading of the temporary and definite prosthesis; (3) monitoring the patient after loading the definite prosthesis.

Therefore the clinical legal medicine specialist physician should always assess the general condition of the patient before assigning his dental lesions a certain number of MCPTs. The amount of time required for an implant to become osseointegrated is a difficult decision to make and highly debated [13]. Some experts talk about a few months for healing but some studies present that early implantation may be done [14]. If loaded too soon, the risks are to move and become not useful at all for further treatments.

Therefore assigning and evaluating the case, planning, preparing the case (bone rim if necessary), implant, osseointegrating and healing, surveillance normally conduct to 2-6 months. In this period of time the bone is healing and so while the implant may not be yet put in place, no other treatment is possible, leaving no other opportunity to the patient. That is why this period of time, as a healing period of time must be included in the MCPTs.

There are some other issues that the implants generate from a clinical legal medicine evaluation perspective:

- there is an endogenous risk, difficult to evaluate from the very beginning, that the implant may be rejected or the bone demineralized near the implant and therefore the implant moved out.
- the implant is guarantee a sum of years (may be 5 or 10 but never more) so the treatment is not "for ever": how then may have the judicial system a correct evaluation of the trauma injury in order to make justice and correct assessment of responsibilities when the implant treatment may be unsuccessful after some months or a few years?
- the costs and the cost/benefice ratio are an important issue: more than 500 E/implant and up to 6 months MCPTs vs. 500 E totally/crown and up to 2 weeks MCPTs; unsecure, sometime unreliable, sometime rejected, all the time under surveillance for new treatments and corrections.
- increased malpractice risks.

So finally, may implant be use in the evaluation of the MCPTs? On the other hand the patient asks for a physiognomic reparation, teeth by teeth, telling that is he loses one why to repair 3 in order to fix only one? Whose responsibilities are these? May be moved on upon the aggressor?

What are his responsibilities if the patient want a more complicate treatment? May the patient asks for his treatment? May be the aggressor be obliged to pay an implant plan assessment and several months of intense and painful treatment that may imply important civil litigations and maybe even penal responsibilities because a longer MCPTs delineate a higher severity and a higher severity higher responsibilities? But is such a case a higher severity case only because the treatment got a longer MCPTs? Therefore is MCPTs a god criterion in such a case, the teeth implant case?

We believe that MCPTs is not a correct clinical legal medicine evaluation in such trauma cases: if dental repair is needed the responsibility must be evaluate taking into consideration the dental treatment based on crown plans (even if these crowns are not the option of the patient); furthermore neither the patient may be obliged to a certain treatment nor the aggressor to a certain payoff decided by the patient. If however the patient desire is for an implant dental treatment, is his choice and he is free to ask but normally is made after an informed

consent and on its own risks. The totally costs of the implant may be imposed to the aggressor in a civil litigation, but this is not the role of the legal medicine practice to assess. What is an option for one person does not impose obligation for another person or for the justice. Integrality of medical status may neither be obtain in both circumstances (crown vs. implant), therefore the right entitlement for an integrality of repair medically may not be constituted. Civil rights are still opened but in dental repair morally and medically the prosthesis crown ought to be the golden rule in the clinical legal medicine evaluation and not the dental implant which case is so sensitive.

Clinical legal medicine evaluation using MCPTs in dental implants generate less objectivity and a higher risk of bias because of its conditionality which may influence the prognostic and prove to be unsecure to use in legal medicine practice when assessing severity in dental trauma.

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References

1. Curca C, Costea A. Evaluarea gravitatii leziunilor traumatice in traumatologia oro-maxilo-faciala. Barem orientativ actualizat. Rev Rom Med Leg 2002;X(3-4):191 - 208.
2. Bastone EB, Freer TJ, McNamara JR. Epidemiology of dental trauma: A review of the literature. Australian Dental Journal 2000;45(1):2-9.
3. Bornstein MM, Chappuis V, von Arx T, Buser D. Performance of dental implants after staged sinus floor elevation procedures: 5-year results of a prospective study in partially edentulous patients. Clinical Oral Implants Research 2008 Oct;19(10):1034-43.
4. Cheung LK, Leung ACF. Dental implants in reconstructed jaws: Implant longevity and peri-implant tissue outcomes. Journal of Oral and Maxillofacial Surgery 2003 Nov;61(11):1263-74.
5. Cochran DL. The scientific basis for and clinical experiences with Straumann implants including the ITI (R) Dental Implant System: a consensus report. Clinical Oral Implants Research 2000 2000;11:33-58.
6. de Barros Ferreira S, Jr., Esper LA, Sbrana MC, Josephson Ribeiro IW, Pompeia Fraga de Almeida AL. Survival of Dental Implants in the Cleft Area-A Retrospective Study. Cleft Palate-Craniofacial Journal 2010 Nov;47(6):586-90.
7. Esposito M, Grusovin MG, Polyzos IP, Felice P, Worthington HV. Interventions for replacing missing teeth: dental implants in fresh extraction sockets (immediate, immediate-delayed and delayed implants). Cochrane Database of Systematic Reviews 2010 2010(9).
8. Esposito M, Murray-Curtis L, Grusovin MG, Coulthard P, Worthington HV. Interventions for replacing missing teeth: different types of dental implants. Cochrane Database of Systematic Reviews 2007 2007(4).
9. Hagi D, Deporter DA, Pilliar RM, Arenovich T. A targeted review of study outcomes with short (≤ 7 mm) endosseous dental implants placed in partially edentulous patients. Journal of Periodontology 2004 Jun;75(6):798-804.
10. Kinsel RP, Liss M. Retrospective analysis of 56 edentulous dental arches restored with 344 single-stage implants using an immediate loading fixed provisional protocol: Statistical predictors of implant failure. International Journal of Oral & Maxillofacial Implants 2007 Sep-Oct;22(5):823-30.
11. Morton D, Bornstein MM, Wittneben J-G, et al. Early Loading after 21 Days of Healing of Nonsubmerged Titanium Implants with a Chemically Modified Sandblasted and Acid-Etched Surface: Two-Year Results of a Prospective Two-Center Study. Clinical implant dentistry and related research 2010 2010;12(1):9-17.
12. Sun HL, Huang C, Wu YR, Shi B. Failure Rates of Short (≤ 10 mm) Dental Implants and Factors Influencing Their Failure: A Systematic Review. International Journal of Oral & Maxillofacial Implants 2011 Jul-Aug;26(4):816-25.
13. Fischer K, Stenberg T, Hedin M, Sennerby L (May 2008). "Five-year results from a randomized, controlled trial on early and delayed loading of implants supporting full-arch prosthesis in the edentulous maxilla". Clinical Oral Implants Research 19 (5): 433–41. doi:10.1111/j.1600-0501.2007.01510.x. PMID 18371094.
14. Gerds TA, Vogeler M (December 2005). "Endpoints and survival analysis for successful osseointegration of dental implants". Statistical Methods in Medical Research 14 (6): 579–90. doi:10.1191/0962280205sm420oa. PMID 16355545.