

Prophylaxis of impacted teeth using MRI and Focal Ultra-Sound ablation?... A feasible hypothesis.

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Abstract:

Abstract: Teeth start as bi-layered epithelial soft tissue follicles within bony jaws. Follicles grow into teeth and erupt. Early **third molar** follicles are detectable 8 to 9 years (± 9 months). Intra-oral dental arches of jaws have finite space accommodating formed crowns. The last teeth to erupt are third molars. When the space needed by all the teeth exceeds the total arch space available, wisdom teeth may become *impacted* in bone. Lower impactions are more prevalent due to the mandible shape, and impaction associated pathologies with erupting partially or totally impacted teeth are common. Impacted third molars are universally prevalent from 17 to 23 years. Third molar impactions are sources of infection, pain, cyst formation and contribute to malocclusions and other pathologies. Surgical removal of third molars is traumatic, invasive and painful and may produce complicating morbidities. **Magnetic resonance imaging (MRI)** is used to locate lesions with clear definition and accurate targeting, both in soft and

hard tissue organs. **Focused ultrasound** (FUS) is used to ablate hard and soft tissue structures and stops growth of targeted pathologies. For example, FUS is used to ablate CNS brain tumours, cell causing Parkinson's disease, prostatic growths and thrombolysis in strokes. **Hypothesis:** Modern imaging techniques, like MRI, can accurately locate third molar follicles at age 9, before wisdom teeth form and grow. *MRI in combination with FUS could be used to ablate follicles of third molars, stop tooth growth (both crown and root) and so avoid later impactions.*

Keywords: Ablation, bone, Focal Ultra-sound, FUS, follicle, impaction, maxillo-facial surgery, Magnetic Resonance Imaging, MRI, prophylaxis, third molars, wisdom-teeth.

Introduction: Teeth start as bi-layered epithelial soft tissue follicles from the dental lamina. Discrete follicles grow into specific shapes, mature, differentiate and calcify into teeth comprising a crown, followed root formation. As roots grow, crowns erupt into the mouth. Early dental follicles of adult third molars can be detected at 9 years (± 9 months).[1] Bony jaws have finite alveolar space to accommodate erupting crowns of formed teeth into dental arches.[1, 2] Erupting teeth follow growth and age sequences; the last teeth to erupt are usually third molars (called 8's and numbered 18, 28, 38, 48 according to IDF; 1, 16, 17 and 32 according to ADA; 'wisdom teeth' according to social convention). When the combined space occupied by tooth crowns exceeds arch space available, third molars usually, [and possibly other teeth], may get stuck in bone, that is **third molars become impacted**. [3] Lower impactions are more prevalent due to the mandible shape, and impactions with associated pathologies are common in the angle of lower jaws. [4] Eruption of 8's is usually from 17 to 23 years, and consequently impacted 8's are universally prevalent among teenagers and young adults. Both genders are equally affected. Wisdom teeth impactions are sources of infection, pain and contribute to malocclusions and other pathologies. [5] Surgical removal of 8's teeth is traumatic, invasive and painful with complicating morbidities. With **Magnetic resonance imaging (MRI)** lesions in both hard and soft tissues are accurately targeted, located and clearly defined. [6,7] **Focused**

ultrasound (FUS) is used to ablate tissue growths and stop further growth of targeted pathologies.[8] For example:- FUS is used to ablate CNS cells of brain tumours [9,10] brain lesions causing Parkinson's disease[11], epilepsy [12] prostatic growths[13, 14], and thrombolysis[14].

Proposed Hypothesis: *Modern imaging techniques such as Magnetic Resonance Imaging, can accurately locate third molar follicles at age 9, before wisdom teeth are formed. Focused Ultra-sound could be used to ablate developing follicles of 8's, and stop tooth growth and development (crown and root) to avoid later wisdom tooth impactions and associated morbidity.*

Implications and Discussion:

Not all third molars become impacted, but many do and need to be surgically removed. This hypothesis for prophylactic management (MRI &FUS) should eliminate all chances of developing impactions of third molars. It will also stop the growth of all third molars, which when missing has little or no impact on mastication , bolus formation or digestion.

After treatment with FUS, subsequent longitudinal monitoring could check for deriving complications for one to ten years. If not treated with FUS, the contra-lateral side could act as control; ipsi-lateral osseous and tooth growth should be monitored using radiography and MRI to note any (unlikely) co-lateral damage.

Should this hypothesis be proved correct and without complications, application of this hypothesis will stop growth and development of 8's. Pre-pubertal FUS therapy on non- calcified third molar tooth follicles will stop tooth growth, stop calcification and development of crowns and root, and avoid later impactions. This provides successful prophylaxis of developing impactions. Optimal operating protocols and technical instructions should be procured from research for human application and management.

Clinical Application: Should FUS therapy prove successful without co-morbidity, FUS could become an essential part of armamentarium for prevention, management and optimal outcomes in the prophylaxis of wisdom teeth impactions. FUS therapy could be introduced as part of the UG curriculum and carried out by Dental specialists (Maxillo-Facial, Periodontics, and Oral

Medicine). FUS therapy could provide a bloodless, non-invasive, minimally painful therapeutic modality for impaction prophylaxis. A professional reimbursable fee for this therapy could be substantiated for expertise, knowledge and skills.

Possible disadvantages: Total “removal” or ablation of the third molar follicle would be mandatory. Although from uses reported, no co-morbidities are anticipated. Should viable cellular residues be left of the ablated dental follicle, these cells may undergo further unwanted growth. Regular post-operative monitoring would be mandatory to ensure no abnormal development obtains. Repeat MRI and FUS may be indicated if residual growth is detected. Invasive surgery may be the last resort to eliminate any expanding lesions.

Challenges and ethical problems: Adequate peer reviewed published data on FUS ablating and inactivating human soft tissue for therapy exists to substantiate the probable success for this hypothesis to work. However, examining children with MRI and radiating developing tooth follicles with FUS as an experimental procedure to avoid future impactions, will not be easily realized, and gaining approval from Research Ethics Boards to test the hypothesis is highly improbable. Procuring data from hominid apes could assist and animal experimentation is indicated to accumulate evidence to change this hypothesis to an applicable medical theory.

Conclusion:

The proposed medical hypothesis states that modern imaging techniques like MRI, can locate developing third molar follicles and in combination with FUS, may be used to locate and ablate follicles of third molars, stop tooth growth and avoid later wisdom tooth impactions.

Declaration: The author has no conflict of interest to declare.

References:

1. MacDonald D. In; Oral and Maxillo-facial Radiology: a Diagnostic Approach. 2011. Eruption sequence and times related to age. Passim. Wiley Blackwell.
2. Cobourne MT, Fleming PS, DiBiase AT, Ahmad S. Clinical cases in Orthodontics. Passim. Impacted third molars. Jul 2012. Orthodontics.

3. Becker A. In: Orthodontic treatment of impacted teeth. 3rd Edition. 2012. Passim Impacted wisdom teeth. Wiley Blackwell.
4. Miloro M, Kolokythas A. Management of complications in Oral and Maxillofacial surgery. Passim. Complications of removal of third molars. Feb 2012. Pathology prevalences. Wiley Blackwell.
5. Wray D, Stenhouse D, Lee D, Clark AJE. In: Textbook of General and Oral Surgery. Ch 27 Wisdom Teeth. Indications for removal of wisdom teeth.(Tables 27.2; 27.3; 27.4). 2003. pp219-228. Churchill Livingstone.
6. Claus EB, Horlacher A, HSU L, Schwartz RB, Cello-Iacono, Talos F et al. Survival rates with low grade glioma after intra-operative magnetic resonance image guidance. Cancer 103. 2005. 1227-1233.
7. Ram Z, Cohen ZR, Henof S, Tal S, Faibel M, Nass D, et al Magnetic Resonance Imaging-Guided, High Intensity focused ultrasound for brain tumour therapy. Neurosurgery.2006. 59;949-956.
8. Jagannathan J, Sanghvi NT, Crum LA, Yen CP, Medel R, Dumont As et al High intensity focused ultrasound surgery of the brain; part 1- A historical perspective with modern applications. Neurosurg 1997.87;955-960.
9. Britt RH, Pounds DW, Lyons BC. Feasibility of treating malignant brain tumours with focused ultrasound. Prog Exp Tumor Res 28. 1984. 232-245.
10. Hynynen K, Clement G. Clinical applications of focused ultrasound in the brain. In J Hyperthermia. 2007. 23;193-202.
11. Deep-brain stimulation for Parkinson's Disease Study group: Deep brain stimulation of the sub-thalamic nucleus of the pars interna of the globus pallidus in Parkinson's disease. New Eng Jnl Med. 2001. 345;201-210.
12. Schrottner O, Eder HG, Unger F, Feichtinger K, Pendl G, Fink M. Radio surgery in lesional epilepsy and brain tumors. Stereotact Funct Neurosurg 70 Suppl1.1998.50-56.
13. Crouzet S, Rebillard D , Chevalier D, Rischmann P, Pasticier G, Garcia G, Rouviere J, Chapelon Y, Gelet A. Multicentric oncologic outcomes of high intensity

focused ultrasound for localized prostate cancer in 803 patients. European Urology 2010.

14. Alexandrov AV, Molina CA, Grotta JC, Garamo Z, Ford SR, et al. Ultra-sound enhanced systemic thrombolysis for acute ischemic stroke. N Engl J Med 2004. 351: 2170-2178.

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