

Iatrogenic injuries to the periodontium

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ABSTRACT

Injuries can be iatrogenic, factitious and accidental trauma. Injuries can be due to iatrogenic, factitious and accidental trauma. Iatrogenic injuries can be procedural, non-procedural or both procedural and non-procedural. Iatrogenic injuries to the periodontium can manifest immediately or be delayed in manifestation. Iatrogenic injuries to the periodontium may arise from chemical, physical, thermal or electrical trauma. The management of iatrogenic injuries is dependent on the severity of the involvement in the periodontal tissues. While, in most cases, the elimination of the cause and symptomatic therapy are sufficient.

Human are imperfect so are bound to commit errors thus iatrogenic injuries will remain part of practice but should be reduced to the barest minimum to sustain good patient dentist relationship bearing in mind that many dental treatments are aesthetic.

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INTRODUCTION

Periodontium consists of investing component which is the gingiva and supportive component namely Periodontal Ligament, Cementum and Alveolar bone. Injuries to the periodontium can be due to iatrogenic, Factitious and Accidental trauma. Iatrogenic' came from the two Greek words 'latros' meaning 'doctor or healer' and 'Gennan' meaning 'as a result'. Injury means damage or harm to the body and the medical term for it, is trauma. Thus, iatrogenic injury is a broad term that may be defined as 'harm, damage or impairment that results from the activities of a doctor or healer. It can also be considered as ill health or adverse effect caused by medical treatment. Iatrogenic injuries can be caused by any number of medical oversights or mistakes. They may occur during a hospital stay or a routine

healthcare provider's visit. There are no single cause, medical condition, or circumstance linked to iatrogenic injury occurrence.

Iatrogenesis, the induction of illnesses by the activities of doctors and, by extension, all other health care clinicians, may best be regarded as injury attributable to the adverse effects of or mishaps associated with medical treatment, including various diagnostic and invasive procedures to which a patient has been subjected to, at any time that may result in serious morbidity or death.

Classification of Iatrogenic Injuries

A general classification of iatrogenic injuries in the literature by Lau (2005) was modified for the purpose of simplicity into three based on whether it is related to performed procedure or not or both as

- Procedural in nature (surgical or anesthetic complications including those attributable to invasive diagnostic and palliative procedures and minimal access surgery, adverse events related to diagnostic imaging, radiotherapy, or haemodialysis)/
- Nonprocedural in nature (adverse drug reaction),
- Combined Procedural and Nonprocedural in nature

Impact of iatrogenic injury

Iatrogenic injury has significant population health impact. It can increase length of hospital admission, clinical duration, treatment costs and may also lead to repeat surgeries or procedures. Iatrogenic injuries may have a very poor prognosis if not handled properly. They may cause serious physical, psychological, mental, or emotional problems and in some cases, even death of patient. The death of such patient may then be the subject of mandatory medicolegal investigations and, possibly, civil proceedings.

Iatrogenic injuries can impair doctor patient relationship, reduce patients trust in the doctor, negatively impacts on patients willing to seek care and undergo procedure and lower confidence of doctors in rendering care or performing procedures. Ultimately there will be complicated conditions on patients' side and loss of revenue, burnout and adverse psychological effects on the doctors' side. Iatrogenic injuries may lead to disputes/litigation. Nonnegligent infliction of iatrogenic injury is a common pattern in medical malpractice lawsuits,

Factors leading to increasing prevalence of iatrogenic injuries

A meta-analysis showed the incidence of iatrogenic disease to be between 3.4% and 33.9% (Atiqi et al., 2010). There are as many as 72.4% of iatrogenic complications that may well be preventable (Brennan et al., 1991) but there appears to be an increasing number of iatrogenic injuries because human life has been gradually prolonged as such, (1) the population of elderly people is increasing; (2) metabolic diseases are becoming increasingly more common; (3) surgical indications are expanding, more difficult operations are being performed, and operation time is getting longer; (4) new drugs (e.g.,

antitumor treatments, immune treatments, and hormones) and various types of implantable biological materials are being used; (5) drug-resistant bacteria have emerged; and (6) new therapeutic modalities, such as those involving electricity, magnetism, and light, are being developed (Lau, 2005).

Mechanism of iatrogenic injuries

Iatrogenic injuries can be caused directly or indirectly by any healthcare worker involved in the patient's care. They can occur during any surgical procedure on pathologies that are located at or near the target organ due to inadvertent direct injury to the target organ. There is also risk for an indirect injury from transmitted force to the target organ.

Characteristics of iatrogenic injuries

Unintentionally: These types of injuries are rarely intentional. It usually results from a mistake as medical providers are humans thus are prone to err.

Occurrence: It can occur at any phase of care, diagnosis, preoperative, treatment-intraoperative, postoperative and recovery period.

Manifestations: It may be immediate or delayed: The manifestation may be immediate as in gingival bleeding from bur during crown preparation or delayed as in periodontal pocket from overhanging restoration.

Avoidable: Iatrogenic injuries can be of avoidable and unavoidable types. Unavoidable iatrogenic injuries are necessarily caused by the treatment itself. Avoidable iatrogenic injuries include other interventions in medical practice which may include side and adverse effects of drugs.

Rule of medical ethics: Iatrogenic injury breaks the oldest and most famous: *primum non nocere*, or above all, do no harm.

Relationship with negligence: It differs from negligence: As long as a doctor treats a patient with reasonable care, the doctor has not committed a legal wrong, even if the doctor inflicts iatrogenic injury. More specifically, unjustified and unexcused iatrogenic injury is a breach of a physician's duty of nonmaleficence done of the four pillars (along with beneficence, justice, and autonomy) of the modern structure of medical ethics.

Age of the affected individuals: The risk of iatrogenic injuries in individuals over the age of 65 is

twice as high as that of a younger person and they are more severe in the elderly (Barr & Kauffman, 2014)

Incompetence: Iatrogenic injury is not necessarily an indication of incompetence of the healthcare provider.

Effect of morbidity: They constitute a constituting a significant source of therapeutic risk to patient and also a direct or indirect cause of morbidity.

Iatrogenic Dental injuries

In our context, Iatrogenic injury can be defined as any trauma that has been induced by the dentist's activity, manner, or therapy. The injuries can be on Hard tissues (tooth, Bone, TMJ), soft tissues (gingiva, tongue, oral mucosa) or Both. Iatrogenic injuries are common in clinical practice of dentistry and they can impair patients' normal oral function and cause pain in patients' eating, chewing, talking, smiling, laughing and swallowing. However, Iatrogenic injuries in dentistry are neglected because they are usually not life threatening. The factors that contribute to prevalent Iatrogenic Injuries in Dentistry are the fact that 1. Oral environment is a confined space with restricted access, 2. Dental treatments are done with cutting rotary instrument with high speed, 3. Heat generated by these instruments if not controlled can cause damage, 4. Manual treatments are done with sharp cutting and pointed instruments, 5. Chemicals and Materials used for treatment can cause damage, 6. Unexpected patient movement and 7. Operator/Patient fatigue

The Iatrogenic injuries that occur in dental practice include but not limited to Injury to adjacent teeth during tooth extraction, Temporomandibular joint dislocation during tooth extraction, Displacement of root in maxillary sinus during tooth extraction/oroantral communication, nerve damage during extraction. The inferior alveolar nerve (IAN) was the most commonly injured nerve followed by the lingual nerve in terms of nerve injury during deposition of local anaesthesia and fracture of mandible during third molar disimpaction (Zuniga, 2009).

Others include Laceration of gingiva during various dental procedures, Damage of tooth during preparation of adjacent class II cavity, Overextension of removable prosthesis, Loss of retention of removable prosthesis, Exposure of pulp during cavity preparation, Overhanging of restorations and

infection. A report of herpes labialis as a consequence of scaling and root planing in Nigeria exists in the literature (Azodo and Erhabor, 2013).

Consequences of Iatrogenic injuries in Dentistry

The consequences of Iatrogenic injuries include Decreased/loss confidence in Dental care, Mistrust, hampered patient-dentist relationship, Increased morbidity, Increased treatment cost, Increased treatment care, Increased recovery time, Loss to time, income and resources, decline in fame, Decrease growth and Litigations

Iatrogenic injuries to the Periodontium

Iatrogenic injuries to the Periodontium are injuries caused unintentional by the Dentist to gingiva, periodontal ligament, cementum or alveolar or a combination. They may manifest in the immediate or delayed and the presenting lesions may be edematous, erythematous, or whitish in appearance. During dental and periodontal treatments, numerous instruments (i.e., rotary or vibrating handpieces, electrosurgical units, and lasers), chemical substances (i.e., drugs, endodontic materials, and retraction agents), and physical appliances (partial dentures and orthodontic appliances) come in contact with the oral cavity, and improper use or application of these may result in traumatic gingival lesions.¹ In acute cases, epithelium and connective tissues are usually involved with the slough of the epithelium, erosion or ulcer formation, and erythema. In severe cases, alveolar bone and tooth may also be involved.

Iatrogenic injuries to the Periodontium may present as follows

- Bleeding
- Laceration
- Burns
- Gingival recession
- Gingival enlargement
- Ulcerations
- Pain
- Dental hypersensitivity
- Post operative infection and abscess
- Tooth mobility
- Root resorption
- Periodontitis
- Bone defects-Dehiscence, Fenestrations

Iatrogenic injuries to the Periodontium may be classified using different parameters like timing of manifestation, avoidability, anticipation, type of trauma and type of procedure.

Based on timing of manifestation

- Immediate
- Delayed

Based on avoidability

- Avoidable
- Unavoidable

Based of anticipation

- Clinically anticipated
- Clinically unanticipated

Based on trauma type

- Chemical
- Physical
- Thermal
- Electrical

Based on procedure type

- Periodontal
- Surgical
- Conservative
- Endodontic
- Orthodontic
- Prosthodontic

Chemical injuries

Chemical injuries of the oral soft-tissues occur due to the large number of chemical substances, such as drugs and various agents, which come in contact with the oral cavity (Shetty, 2006). Adhesives used in Dentistry have been shown to be toxic to the gingival fibroblasts (Szep et al., 2002). Residual monomers in dentures may cause gingival irritation and inflammation (Szep et al., 2002). Phosphoric acid, used as an etchant and as a root surface modifier, causes necrotizing effects on periodontal soft tissues (Blomlof and Lindskog, 1995). Tetracycline hydrochloride used as root conditioner can cause cautery of the gingiva. Chemical injuries of the gingiva may occur due to silver nitrate, Endodontic materials such as formocresol and sodium hypochlorite that come into contact with the oral cavity. Gingival retraction cords impregnated with ferric sulfate, aluminum sulfate, or aluminum chlorur are often used in fixed prosthodontics for the temporary displacement of free gingival tissue before an impression can cause injury to the gingival tissue.

Physical Injuries

The main causes of physical iatrogenic injuries include traumatic orthodontic applications and ill-fitting prosthetics. When administering local anaesthetic agent, injury, accidental pricking/tearing of the gingiva may occur. Instruments rotating at high speeds such as discs, burs, scalers are likely to cause injuries if not well controlled. Orthodontic wires, brackets, can cause gingival and mucosal injuries during orthodontic treatment (Meeran, 2013). Improper placement and removal of matrix band/wedge during restorative procedures can result in inflammation of gingiva. Rubber dam clamps often gouge the gingival and abrade the cementum and root surface, especially when inadequately seated and supported because a limited number of clamp sizes fitting an unlimited variety of tooth shapes (Alexander,1971). Gingiva can be lacerated resulting periodontal damage and bacteremia when seating clamps (Smigel, 1988). Removable denture can abrade the gingiva during try-in. Other laceration injuries can be caused to gingiva and other intraoral tissues when these sharp instruments accidentally slip during minor oral surgery or other procedures. Crush injuries most commonly arise during minor oral surgery procedures Occasionally, palatal or lingual arches may cause trauma to the tongue and palate with implication on the gingiva.

Thermal injuries

Thermal injuries of the gingival and oral mucosa are caused by excessive heat when using ultrasonic scalers, electrosurgery techniques, heated dental instruments, and other rare applications can cause thermal injuries (Kwon et al., 2013). Electrosurgery permits an adequate contouring of the tissue and controls hemorrhage. However, the heat generated by injudicious use can cause tissue damage and the loss of periodontal support when the electrode is used close to the bone. When electrosurgical electrode contacts the bone, irreparable damage may occur but when it touches the root and areas of cementum, burns result.

Electrical injuries

Electrosurgery involving cervical restorations consistently resulted in coagulation necrosis of the pulp and extensive resorption of cementum, dentin, and interradicular bone in the furcation area of multirooted teeth (Robertson et al., 1978).

Treatment

The management of traumatic injuries is dependent on the severity of the involvement in the periodontal tissues. While, in most cases, the elimination of the offending agent and symptomatic therapy are sufficient. The treatment may include suturing laceration, reducing restoration high spots, turking wire properly, desensitization, Splinting of mobile teeth, Removal of overhang or redoing the restoration, Perform new restoration in overcontoured or undercontoured restorations, Fabrication of new Denture. In severe cases, or when the injury results in permanent defects, periodontal surgery and regenerative therapy may be necessary.

Prevention

To identify patients at high risk is the first step in prevention, and most iatrogenic diseases are avoidable. Training, retraining, continuous training will help healthcare providers to achieved high level of competence to reduce the chances of iatrogenic injuries and also help identify patient at high risk of iatrogenic s as to success-oriented steps to prevents the occurrence.

Skilful, composure, precision-speedy execution and friendly healthcare providers will allay anxiety and fear of patients, reduce fatigue and improve cooperation which will ultimately lessen the likelihood of iatrogenic injuries

Visibility and accessibility, proper instrument and handpiece handling, adequate Finger rest are vital in the prevention of iatrogenic injuries since tissues are seen properly and instruments are less likely to slide

CONCLUSION

Human are imperfect so are bound to commit errors thus Iatrogenic injuries will remain part of practice but should be reduced to the barest minimum to sustain good patient dentist relationship bearing in mind that many dental treatments are aesthetic. Various qualities like patience, politeness, empathy, patient handling, time management, precision, accuracy, decision making power for better treatment; also treating the complications if encountered during the treatment and ensuring patient about the benefit from the procedure without any unsolicited side effects after the treatment should be cultivated among Dentists and Dental Students

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