



Comprehensive Treatment of Impacted Teeth with Comprehensive Oral Clinical Diagnosis and Treatment Thinking

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Abstract: Impacted teeth are a common disease in oral surgery, which can be caused by systemic factors and local factors, and the incidence of different genders, races and tooth positions is different. The clinical manifestation of impacted teeth is the absence of permanent teeth in normal position. Cone beam CT can accurately diagnose and locate impacted teeth. At present, surgical fenestration or direct extraction are often used to treat impacted teeth, but the treatment effect and prognosis are not ideal enough. In the process of oral clinical diagnosis and treatment, doctors began to adopt comprehensive diagnosis and treatment thinking to solve problems, and the key to improve the success rate of oral disease treatment is to make a clear diagnosis, reasonably evaluate the difficulty of treatment and adopt appropriate correction methods. This paper summarizes the research status of impacted teeth in recent years, focusing on the multidisciplinary comprehensive treatment of impacted teeth, in order to improve the clinical comprehensive diagnosis and treatment thinking of dentists and provide reference for accurate treatment of impacted teeth and reduction of complications in the treatment process.

Keywords: impacted teeth, comprehensive thinking of oral clinical diagnosis and treatment, multidisciplinary combined treatment

1. Introduction

Impacted teeth refer to teeth that can only partially erupt or cannot completely erupt because of the obstacles of adjacent teeth, jaws or soft tissues. Mild impacted teeth may erupt delayed or dislocated, and severe impacted teeth may be embedded in the bone. Impacted teeth are a common disease in oral surgery. Young and middle-aged people are the main groups, which pose a certain threat to the oral health of the body and need timely and correct treatment and intervention. Clinically, surgical fenestration guided eruption procedure or direct extraction are often used to treat impacted teeth, but the curative effect and prognosis are not ideal enough. At present, multidisciplinary comprehensive diagnosis and treatment cooperation has become an important measure to improve medical service capacity. Therefore, it is of great significance to study the multidisciplinary comprehensive diagnosis and treatment methods of impacted teeth, cultivate the comprehensive clinical diagnosis and treatment thinking of dentists, choose the best diagnosis and treatment scheme, and reduce the incidence of complications during treatment.

2. Research status of impacted teeth

2.1 Incidence and etiology of impacted teeth

Clinically, impacted teeth often occur in mandibular third molar, maxillary canine, maxillary central incisor and mandibular second molar. Mild impacted teeth may erupt delayed or dislocated, and severe impacted teeth may be embedded in the bone. The most common impacted teeth are maxillary and mandibular third molars, with a general prevalence rate of 25%-50% and certain ethnic differences; Secondly, the prevalence rate of impacted maxillary canines is 1%-3%, with a certain gender difference, generally more women than men; In the maxillary anterior teeth area, the incidence of maxillary impacted incisors is second only to canines, with a prevalence rate of 0.06%-0.20%[1]. There are many factors that cause impacted teeth, and local factors include redundant teeth, retention or premature loss of deciduous teeth, abnormal position of tooth germ, cyst or insufficient eruption space of permanent teeth. Systemic factors are mainly due to the higher degree of jaw degeneration than tooth degeneration, which leads to the tooth size-jaw size discrepancy, or the influence of hereditary diseases such as cleidocranial dysplasia syndrome[2-3].

2.2 Clinical manifestations and complications of impacted teeth

The clinical manifestations of impacted teeth are the absence of permanent teeth in the normal position, the occurrence of tooth space in the impacted teeth, the displacement of adjacent teeth to the edentulous area and the elongation of the edentulous area to the jaw teeth, which may lead to the disorder of jaw relationship, and may be accompanied by toothache, gingival swelling, numbness of lower lip, periodontal damage, difficulty in swallowing and oral odor. Root resorption of adjacent teeth is one of the common complications of impacted teeth. Impacted teeth themselves can also undergo external resorption, bone adhesion and alveolar bone resorption in the jaw, and alveolar bone fractures are prone to occur in this area when there is trauma. Impacted teeth compress nerves, causing corresponding neurological symptoms, and may also become the focus of infection, resulting in secondary inflammation, cysts and so on[1]. Dentists need to fully evaluate the position of the embedded teeth, the long axis of the teeth and the relationship between the impacted teeth and the adjacent teeth in order to better judge whether the impacted teeth can erupt.

2.3 Clinical routine diagnosis and treatment scheme of impacted teeth

The conventional treatment of impacted teeth can be divided into two categories: retaining impacted teeth and giving up impacted teeth.

2.3.1 Not processed temporarily

For impacted teeth with only gum coverage and enough eruption space, they can be temporarily left untreated and the eruption of teeth can be observed. If it still doesn't erupt after half a year, consider whether to carry out embedded tooth traction. In addition, for impacted maxillary canines with fully formed roots, if its position is too deep, inverted or horizontal, imaging examination is needed to ensure that it will not cause damage to surrounding tissues or adjacent teeth, and treatment can be temporarily stopped, but regular follow-up observation is needed[4].

2.3.2 Surgical fenestration guided eruption procedure

If the patient has only a few impacted teeth and the position is superficial, soft tissue protrusion can be observed on the gums; If there is no other malocclusion or deformity, the cutting end or cusp of the corresponding tooth can be exposed by surgery alone, and the teeth can erupt by decompression and guidance[5]. However, it is necessary to observe the eruption of teeth to prevent the gums from covering the teeth again and affecting the normal eruption of teeth.

2.3.3 Surgery to remove pathological factors before diagnosis and treatment

For cyst or tumor cases, the primary factors should be removed by surgery first, and then the treatment time should be evaluated after surgery when new bone is formed in the affected area. When there are problems such as supernumerary teeth and retained deciduous teeth, the retained deciduous teeth and supernumerary teeth should be pulled out as soon as possible to remove the obstacles to eruption, so that permanent teeth can erupt on their own. If the impacted teeth are caused by insufficient space, we can cooperate with orthodontic treatment to expand the space at an early stage and observe the eruption of the impacted teeth[4].

2.3.4 Surgical fenestration combined with orthodontic traction treatment

After the local soft and hard tissue obstacles are removed by surgery, the impacted teeth are exposed but can not erupt smoothly, so the impacted teeth can be pulled to the normal position by bonding orthodontic accessories.

2.3.5 Extraction of impacted teeth

For impacted teeth with poor development or difficult traction, and patients with crowded or protruding dentition, we can consider giving up impacted teeth, closing the gap or repairing missing teeth in subsequent orthodontics.

3. Application of comprehensive oral clinical diagnosis and treatment thinking in the diagnosis and treatment of impacted teeth

At present, the impacted teeth that need to be preserved are mainly treated by surgical induced eruption. However, it is still difficult for most of the impacted teeth to erupt spontaneously after treatment. The prognosis criteria include not only whether the gingival morphology is restored, whether the dentition is arranged neatly, but also whether the gingival curve is beautiful and the attached gingiva is well. The effect of single surgical induced eruption in this respect is not ideal[6]. For impacted teeth with no retention value, complications such as wound swelling, infection and even dry socket often occur after direct extraction, which increase patients' pain and reduces their quality of life. With the development and progress of stomatology, the level of diagnosis and treatment of various complex oral diseases has gradually improved, which requires the joint participation of many disciplines and professions. It is the key to improve the success rate of treatment of complex

impacted teeth by using the thinking of comprehensive clinical diagnosis and treatment, making a clear diagnosis, reasonably evaluating the difficulty of treatment and adopting appropriate therapy.

3.1 Present situation of multidisciplinary comprehensive diagnosis and treatment in stomatology

Multi-disciplinary team (MDT) is usually a clinical diagnosis and treatment mode that is patient-centered, integrates multi-disciplinary opinions, puts forward diagnosis and treatment opinions after multi-disciplinary experts discuss cases, and selects the most suitable individualized treatment scheme for patients by using existing treatment methods, which can provide more efficient, convenient and comprehensive diagnosis and treatment services[7]. Because of the uniqueness of stomatology and its characteristics of diagnosis and treatment, the comprehensive clinical diagnosis and treatment of stomatology has some limitations compared with clinical medicine. At present, the comprehensive research scope is small, but it still has great research and application value. The comprehensive clinical diagnosis and treatment of stomatology mainly includes the combined restoration and implantation of teeth, pulp and periodontium to treat dentition or tooth defect, oral and maxillofacial cleft lip and palate repair surgery, combined orthodontics and orthognathic surgery, etc. According to the data analysis of the diagnosis and treatment of oral squamous cell carcinoma in oral and maxillofacial surgery by MDT in the affiliated hospital of Qingdao University[8], it is found that the diagnosis and treatment scheme formulated after discussion by multidisciplinary consultation group can provide personalized comprehensive diagnosis and treatment suggestions for complex oral cancer patients with systemic diseases, improve oral and maxillofacial surgeons' cognition of systemic diseases and their ability to deal with related diseases, and promote exchanges and cooperation among disciplines. Through a randomized controlled trial, Tian Ye et al. adopted LBL teaching method in the control group and MDT+CBL teaching method in the experimental group[9], found that multidisciplinary collaborative diagnosis and treatment combined with case study teaching method can significantly improve the learning effect and teaching satisfaction of geriatric stomatology, which is conducive to the improvement of clinical teaching quality and has good application value and feasibility. Liu Bing and others have studied whether the MDT model based on group case teaching can achieve better training effect compared with the TBL+PBL+CBL teaching model [10]. The results show that the combination of TBL, PBL and CBL teaching models can achieve good results in prosthodontics teaching for trainees, and the MDT teaching model can further improve the teaching quality, especially the clinical thinking ability and comprehensive diagnosis and treatment ability. The Ninth People's Hospital affiliated to School of Medicine, Shanghai Jiaotong University summarized the process of digital-assisted multidisciplinary joint diagnosis and treatment of complex midfacial fractures and evaluated its therapeutic effect [11]. It was found that the digital-assisted multidisciplinary joint diagnosis and treatment model has high application value in functional and shape restoration and reconstruction of complex midfacial fractures, which is worth further promotion and research in oral clinical work.

3.2 Multi-disciplinary clinical comprehensive diagnosis and treatment of impacted teeth

Single surgical treatment for complex impacted teeth is often not ideal. Therefore, it is of great significance to study the multidisciplinary comprehensive diagnosis and treatment methods of impacted teeth and find out the best diagnosis and treatment scheme, which will improve the curative effect and prognosis of impacted teeth and reduce the occurrence of complications.

3.2.1 Diagnostic analysis of impacted teeth

According to the patient's chief complaint and symptoms, relevant information can be obtained by asking medical history, physical examination, imaging examination and necessary laboratory examination, so as to determine the key of the problem and make targeted diagnosis.

3.2.1.1 Medical history

Most patients come to see a doctor because the deciduous teeth do not fall off normally or the permanent teeth do not erupt after deciduous teeth fall off, which is usually found after taking periapical radiograph or panoramic radiograph.

3.2.1.2 Clinical examination

In the clinical examination, if the permanent teeth erupt beyond the normal time or the opposite permanent teeth with the same name have erupted, there is not enough space in the dentition for the replacement permanent teeth to erupt, and the adjacent permanent teeth rotate or deform, it is suggested that the missing permanent teeth may be impacted. Congenital absence of lateral incisors or the presence of fan-shaped incisors suggest that maxillary canine palatal impaction may occur. Clinically observe whether the patient has deciduous teeth retention, whether there is an improper dentition gap in the dental arch, whether the missing teeth can touch the cusp or incisal margin, and whether there is abnormal bone swelling. Impacted teeth are often difficult to be detected by patients, so it is difficult to make a correct diagnosis of impacted teeth only through

clinical manifestations, and imaging examination should be combined.

3.2.1.3 Imaging examination

The number and approximate position of impacted teeth were preliminarily diagnosed by panoramic radiograph combined with periapical radiograph. Compared with the traditional two-dimensional image, CBCT has higher definition, which can show all angles of impacted teeth and visually observe the shape and size of impacted teeth. Through three-dimensional reconstruction, the surface morphology of the patient's jaw is observed from different angles, and the results are not affected by the patient's posture and projection angle. Clear images of impacted teeth, adjacent teeth and surrounding soft and hard tissues can be obtained from three-dimensional directions, which can more accurately diagnose and locate impacted teeth and play an important role in the diagnosis of impacted teeth[4]. There are various imaging manifestations of impacted teeth in alveolar bone. At present, there is no unified classification method. Most of them are judged and described by the position of the dental crown inside and outside the dental arch and the orientation of the long axis of the dental crown, including palatal impaction, labial impaction, inverted impaction, oblique impaction, multiple impacted teeth, impacted teeth with odontoma and so on.

3.2.2 Study on comprehensive treatment of retained impacted teeth

Impacted teeth can seriously affect patients' oral health, facial beauty and pronunciation function. In the past, the impacted teeth were often extracted under local anesthesia, and then the extracted parts were repaired. However, this method has a long treatment cycle and great trauma, which increases the pain of patients to some extent. Therefore, for impacted teeth with reserved value, multidisciplinary comprehensive diagnosis and treatment can be adopted to improve the prognosis.

3.2.2.1 Using impacted teeth to repair dentition defect

Clinically, the mandibular third molar is easily impacted by mesial inclination, which leads to the caries of the mandibular second molar. When restoring the patient's defective dentition, if the patient's second molar can't be kept in the mouth due to dental problems and the third molar has ideal physiological conditions, the impacted third molar can be upright and moved proximally by orthodontic method to replace the function of the second molar. Aili Qiao et al. found that[12] it is feasible to correct the impacted third molar and move forward to replace the damaged first or second molar, but we should pay attention to the complications of root resorption and periodontal health during the treatment, and check the occlusal trauma in time. In addition, most elderly patients have the situation that the mandibular third molar is impacted forward and remains while most other teeth are missing. Xu Jie's research results confirmed that[13] the use of mandibular impacted teeth for fixed denture repair for dentition defect patients can obtain good restoration effect and obviously improve patients' subjective feeling and chewing function.

3.2.2.2 Surgical fenestration combined with orthodontic traction treatment

Relevant research points out that for patients with impacted teeth with reserved value, adding orthodontic treatment on the basis of surgical induced eruption can promote the treatment of impacted teeth. After surgical removal of local soft and hard tissue obstacles, teeth still cannot erupt smoothly, so orthodontic traction treatment is needed[14]. Becker summarized two kinds of surgical methods[15], the open eruption method and the closed eruption method. Jiang Xiaochuan et al.[16] found that orthodontics combined with surgical eruption can significantly improve the clinical effectiveness of impacted anterior teeth, shorten the time of gingival breaking, restore chewing ability and have a low adverse reaction rate, which can improve patients' treatment satisfaction and quality of life. Chen Xiangsa et al.[17] and others treated children with impacted maxillary anterior teeth with surgical eruption and orthodontic treatment. They found that patients felt less pain, which was beneficial to promote the spontaneous eruption of the affected teeth and had obvious advantages in aesthetics and clinical treatment efficiency.

3.2.2.3 Autogenous teeth transplantation of impacted teeth

Autogenous teeth transplantation is to transplant the patient's own teeth from one position to the alveolar fossa of another part of the same individual in order to achieve the effect of repair. Clinically, when the impacted teeth with poor position cannot be induced by orthodontic method, if there are ideal replantation conditions, they can be removed by surgery and transplanted to the normal position to replace the missing teeth. Rohof et al.[18] transplanted donor teeth with incomplete root development and followed them for a long time. It was found that the survival rate and success rate in 15 years and 10 years were very high, reaching over 90%. However, autogenous tooth transplantation is prone to adhesion or root resorption, and the long-term prognosis may be slightly worse than that of orthodontic guided eruption.

3.2.3 Study on comprehensive treatment of giving up impacted teeth

For impacted teeth with poor self-development or difficult traction, and patients with crowded or protruding dentition,

we can consider pulling out the impacted teeth and closing the gap later or repairing the missing teeth.

3.2.3.1 Impacted teeth to be extracted in orthodontics

When the patient's dentition is crowded or the protrusion deformity is obvious, and it is necessary to extract teeth for orthodontic treatment, we can consider directly extracting impacted teeth, especially those with abnormal root shape, and closing the gap in orthodontics to simplify the treatment. However, in the process of clinical orthodontic treatment, we should pay attention to the timing of extraction of impacted teeth in combination with specific cases. Some impacted teeth that meet certain physiological conditions can also be reserved first, or they can be used as anchorage to assist the posterior teeth to move forward and close the orthodontic extraction gap.

3.2.3.2 Minimally invasive extraction of impacted teeth

The oral anatomy is complex and the space is small, which increase the difficulty of tooth extraction. Traditional auxiliary instruments for tooth extraction may also cause different degrees of hard tissue damage, and some complications such as swelling, pain and bleeding, etc., which will cause certain physical and mental damage to patients and produce greater psychological pressure. With the gradual improvement and innovation of oral medical technology, new technologies such as minimally invasive tooth extraction with high-speed dental turbine and ultrasound scalpel are gradually applied to oral clinical treatment. Compared with traditional tooth extraction, minimally invasive tooth extraction can make the affected teeth easily come out more scientifically and reasonably, greatly reduce the damage to alveolar bone caused by tooth extraction and have less postoperative pain. Moreover, doctors can control the cutting range and direction more accurately, which play a positive role in improving the prognosis of patients[19]. Compared with traditional manual and electric orthopedic surgical instruments, ultrasound scalpel can only destroy tissues with specific hardness, avoid the damage of nerve and blood vessel tissues, and also have the effect of incision hemostasis, thus reducing surgical wounds and ensuring surgical accuracy and safety[20].

3.2.3.3 Relaxation therapy combined with music intervention for extraction of impacted teeth

Tooth collars, tooth forceps and other instruments will be used in the process of tooth extraction, which will easily lead to a series of negative emotions, aggravate the pain of patients and have a negative impact on their compliance. Relaxation therapy combined with music intervention mainly uses skeletal muscle relaxation and music rhythm to improve patients' physiological indexes and make patients feel relaxed and happy[21]. Previous studies focused on the pain degree and psychological state of patients with impacted teeth extraction, but less on relaxation therapy. Qin Du et al. applied music intervention combined with relaxation therapy in patients with impacted teeth extraction[22], and the study found that the combination of the two can better alleviate the negative emotions of impacted teeth extractors and improve the pain degree of patients.

3.2.3.4 Preparation of autogenous tooth bone graft material from impacted teeth

Autologous dental bone graft material is a new bone graft material with simple preparation and convenient operation. It is generally taken from patients' own teeth extracted due to impacted teeth and periodontal diseases, and has good biocompatibility, great osteoinduction, osteogenesis and osteoconduction ability, low immune rejection and infection rate. Studies in the Department of Stomatology, the First Affiliated Hospital of Chongqing Medical University show that[23], compared with Bio-Oss bone powder, autogenous dental bone graft material can effectively increase the width of alveolar bone after operation, delay the bone absorption at the edge of implant, obtain better implant stability and have higher biological safety. However, at present, autogenous dental bone graft materials are not widely used in China, and the storage methods and physical and chemical stability of autogenous dental bone graft materials need further study.

4. Prospect

To sum up, most of the impacted teeth can't reach the best health condition after single surgical eruption or surgical extraction. A large number of studies have pointed out that multi-disciplinary joint diagnosis and treatment can promote the treatment of impacted teeth. The thinking of comprehensive clinical diagnosis and treatment of stomatology involves a wide range of stomatology fields and knowledge. It is necessary to systematically consider various factors in order to better provide patients with efficient, comprehensive and individualized medical services. It is the basic ability and accomplishment of dentists in their work, and also the key for medical workers to continuously improve their own ability and provide medical and health services. Through multidisciplinary joint diagnosis and treatment, patients can be comprehensively evaluated by a team composed of multidisciplinary stomatologists before treatment. Doctors integrate advanced concepts and technologies, put forward opinions and suggestions from different perspectives, study and solve the diagnosis and treatment of difficult diseases involving multidisciplinary and multi-systems. Doctors provide patients with personalized

and precise treatment programs, reduce the number of their visits, improve the efficiency of medical treatment, and achieve the purpose of "promoting the development of disciplines, improving clinical pathways, optimizing treatment programs, meeting patients' needs" to realize the double promotion of the development of stomatology and the experience of patients' visits. At present, it is still of long-term significance to study the clinical diagnosis and comprehensive treatment methods of impacted teeth, cultivate the comprehensive clinical diagnosis and treatment thinking of dentists, choose the best diagnosis and treatment scheme for maintaining patients' oral health, improve the quality level of stomatology education and promote the development of stomatology.

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