

Case Study Teaching of Edentulous Dental Implant Fixation Restoration based on the Concept of "Injury Awareness"

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Abstract: This article discusses an innovative approach to dental education that integrates "injury awareness" into the clinical teaching of graduate students in dentistry. The study focuses on implant fixation restoration for edentulous patients, using real clinical cases to cultivate students' awareness of caring for patients and to enhance their professional knowledge. The project emphasizes multidimensional thinking, communication skills, understanding patient needs, and humanistic care throughout the treatment process. The implementation plan includes steps such as medical history collection, needs analysis, diagnosis planning, treatment planning, and multidisciplinary collaboration. The effectiveness of the educational reform is evaluated in terms of student benefits, teacher team building, course construction, and textbook development. The article concludes that this approach not only imparts technical skills but also fosters a humanistic care that improves patient treatment experiences and strengthens the doctor-patient relationship.

Keywords: Dental Education; Injury Awareness; Edentulous Patients; Implant Fixation Restoration; Multidisciplinary Thinking; Humanistic Care; Clinical Teaching; Graduate Students in Dentistry.

1. Research Background

Graduate students majoring in dentistry systematically learn basic theoretical knowledge during their undergraduate studies, but due to limited clinical internship time and hands-on opportunities, they often focus more on consolidating and enhancing their professional knowledge in their work. This situation leads to their neglect of the true needs of patients and a lack of attention to injury awareness, which to varying degrees constrains their actual clinical work abilities. Therefore, how to improve the teaching quality of graduate students in the field of dentistry and effectively integrate injury awareness into clinical teaching practice has become an important issue in cultivating dental talents, which urgently needs to be deeply explored and solved.

2. Research Topic

This case study focuses on implant fixation restoration for edentulous patients. Through real clinical cases and the concept of "injury awareness", it aims to cultivate students' awareness of caring for edentulous patients. In clinical scenario simulations, students will learn professional knowledge that may be involved in the entire process of receiving and treating patients, as well as how to effectively communicate, understand patient needs, and demonstrate humanistic care in technical operations.

3. Design Concept

This project focuses on the process of fixed restoration of edentulous jaw implants, integrates relevant disciplinary knowledge, constructs a case library, adopts case teaching method and discussion teaching method, and cultivates students' multidimensional thinking ability. At the same time, in the teaching process, emphasis is placed on the connotation of "love for the injured", guiding students to pay attention to

the needs and interests of patients, and integrating humanistic care throughout the entire treatment process.

4. Implementation and Effectiveness

4.1. Teaching Target

I am a master's student majoring in dentistry at Norman Bethune School of Stomatology, Jilin University.

4.2. Implementation Plan

This project focuses on implant fixation and restoration of edentulous jaws, aiming to enhance the clinical diagnosis and treatment capabilities, scientific research thinking, and patient care awareness of graduate students in dental implantology.

1. Steps of teaching reform

(1) Medical history collection: By simulating reception scenarios, students are trained in communication skills and develop the ability to think from others' perspectives.

(2) Needs analysis: By discussing the psychological needs of edentulous patients, help students understand their emotional state.

(3) Diagnosis plan: Practice clinical examination and imaging evaluation to enable students to comprehensively analyze the patient's condition.

(4) Treatment plan: Introduce different implant repair methods and develop personalized treatment plans based on the specific situation of the patient.

(5) Multidisciplinary collaboration: Analyze the knowledge of oral surgery, restorative science, and other disciplines related to edentulous jaw restoration, and cultivate students' comprehensive thinking abilities.

(6) By simulating the actual clinical situation and analyzing the medical ethics and humanistic issues that may occur and be involved in the entire process of receiving patients and implant repair, the goal of cultivating injury awareness is

silently achieved through the organic combination of professional theoretical knowledge and clinical practice.

2. Teaching case:

(1) Medical history collection and etiological analysis
[Case Summary]

The patient is a 59-year-old male. I came to our hospital for treatment due to 'bilateral posterior tooth loss for more than 5 years'.

1) Chief complaint: Bilateral posterior tooth loss for over 5 years.

The doctor (played by a student) questions the medical history in a targeted manner around the chief complaint. In the process of inquiring about medical history, one should follow the moral requirements of "dignified behavior, enthusiastic attitude; full attention, appropriate language; patient listening, correct guidance".

A. Reasons for dental defects

B. Is there a history of repairs?

C. Is it accompanied by other systemic diseases? Family genetic history?

D. Medication use and history of drug allergies.

E. Dietary habits, smoking and drinking habits, family history, etc.

F. Do you need immediate repair?

2) Present medical history: The patient had bilateral posterior tooth loss caused by dental caries 5 years ago and had undergone porcelain bridge restoration. Cannot be used now, requires dental implant restoration.

3) Medical history: denies infectious and genetic diseases.

(2) Diagnostic plan

1) Clinical examination

During the examination process, it is necessary to pay comprehensive attention to the patient's physical and psychological state, in order to lay a good foundation for subsequent examination and treatment, and improve patient

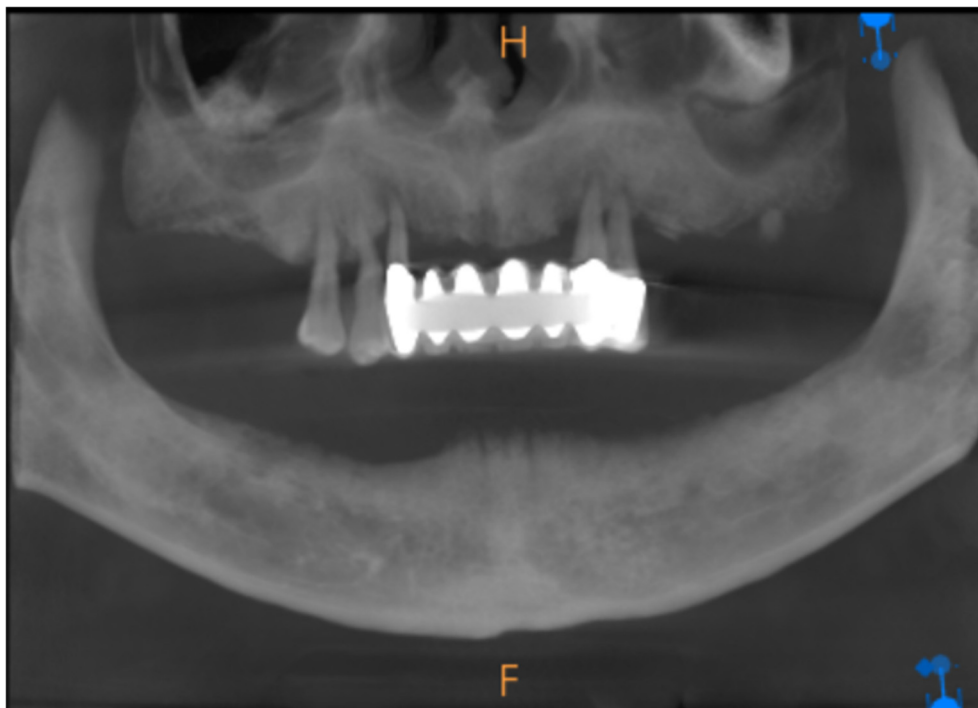
compliance. Guidance teachers need to emphasize the principles that graduate students should follow when conducting examinations: "systematic and comprehensive, meticulous and rigorous; considerate and caring to alleviate patients' pain; and must respect patients and maintain a fair and selfless attitude", in order to reflect the importance of humanistic care.

A. Routine examination outside the mouth: The patient's facial features are basically symmetrical, with normal opening angle and shape, and normal movement of the temporomandibular joint.;

B. Routine intraoral examination: (16-17, 26-27, 31-37, 41-47) missing, 14 and 15 degrees of looseness, normal keratinized gingiva, incomplete alveolar ridge, 13-25 porcelain bridge restoration, porcelain bridge degree III looseness, mandibular over denture, normal width and height of missing tooth gap. The oral hygiene is average, with no obvious abnormalities observed.

In addition to paying attention to the clinical symptoms of patients, special attention should be paid to their needs. Due to the long-term lack of occlusal contact between posterior teeth, the quality of life is relatively low. Therefore, paying attention to the physical and mental care of patients is also the core content of this case teaching, and it is also a concrete manifestation of the "love injury awareness" concept of "being urgent to patients and thinking about their thoughts".

C. Auxiliary examination: To further determine the necessary auxiliary examination items for the repair plan, CBCT examination showed normal alveolar bone height, alveolar bone width, and alveolar bone density at positions 11, 16, 21, 27, 32, 35, 36, 41, 44, and 46. Residual base tooth roots (13, 14, 15, 24, 25) were visible, and low-density shadows were observed at the 24 apex. The alveolar bone was vertically absorbed to the apex, and no cystic lesions were observed in the bilateral maxillary sinus walls (Figure 1).



CBCT: Cone beam computed tomography
Figure 1. Preoperative CBCT images of patient region

2) Diagnosis and differential diagnosis

A. Form a preliminary diagnosis. Based on the chief

complaint, current medical history, and clinical examination, a preliminary diagnosis can be formed as follows:

- a. Upper and lower dental arch defects;
- b. 15-25 degrees of looseness;

B. The key to cultivating students' comprehensive diagnosis and treatment thinking mode is to address doubts in preliminary diagnosis, difficulties in determining treatment strategies, and complex and difficult cases, aiming to ensure the comprehensiveness and responsibility of patient diagnosis and treatment.

(3) Treatment plan and multidisciplinary diagnosis and treatment

1) Treatment plan: In the process of selecting a treatment plan, multiple aspects need to be comprehensively considered, including whether there are multiple feasible treatment plans, which treatment method should be chosen, how to effectively communicate the selected plan with the patient, ensuring the detailed and accurate medical advice, the completeness of the operation process, regular follow-up after surgery, and collecting necessary imaging data. These are all indispensable considerations.

- A. Full mouth removable dentures;
- B. Implant supported denture restoration;
- C. Implant supported fixed denture restoration.

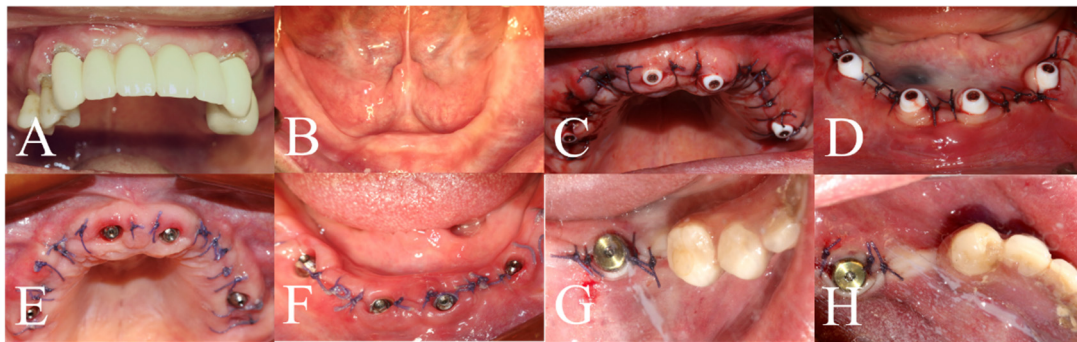
2) Treatment plan

On the basis of correct diagnosis, an appropriate treatment plan is a key link in helping patients repair missing teeth, re-establish occlusion, alleviate patient pain, and improve their quality of life, as follows:

- A. Remove 15-25
- B. (11, 16, 21, 27, 32, 35, 36, 41, 44, 46) Delayed planting
- C. Immediate repair of upper and lower jaw

3) The treatment process

- A. Planting on (11, 16, 21, 27, 32, 35, 41, 44) (Figure 2A-F)
- B. Immediate repair within 24 hours after surgery (Figure 3A-C)
- C. Planting after 3 months (36, 46) (Figure 2G-H)
- D. Digitally scan and create models after 8 months
- E. Final repair after one month (Figure 3D-H)



A: Preoperative maxillary image; B: Preoperative mandibular image; C: Postoperative maxillary image; D: Postoperative mandibular image; E: Maxillary images two weeks after surgery; F: Mandibular images two weeks after surgery; G: Second implantation of the right side of mandibular; H: Second implant for the left side of mandibular.

Figure 2. Surgical procedure



A: Maxillary temporary teeth images; B: Mandibular Provisional Images; C: Maxillary and Mandibular Immediate Restorations; D: Maxillary Final Restorations; E: Mandibular final restoration images; F: Intra-oral images with maxillary and mandibular brackets; G: Intraoral image with maxillary and mandibular final restorations; H: Lower 1/3 of the image behind the final restoration.

Figure 3. Restoration process

4) Therapeutic effect

After determining the implant repair plan, the patient actively cooperated with the treatment and ultimately achieved good repair results.

(4) Case discussion

1) Planting fixed dentures is beneficial for improving chewing efficiency and ensuring quality of life

Traditional removable full dentures are a classic treatment method for missing teeth, which can restore both function and aesthetics. However, due to their large size, insufficient fixation, and low chewing efficiency, this restoration method

can no longer meet the high quality of life needs of patients. There are two types of dental implant restoration schemes for edentulous jaws: covered dentures and fixed dentures. Compared with fixed dentures, covered dentures still require partial mucosal support, have relatively low chewing efficiency, poor stability, and inconvenience in use. This case chose implant supported fixed restoration, which is rigidly connected to the implant and fully supported by it. The patient does not need to remove it, and the fixation and stability performance are the best. The chewing efficiency is close to that of natural dentition, greatly improving the patient's

quality of life^{7,8}. In addition, Gracht et al. conducted a meta-analysis and found that patients who had previously undergone traditional denture restoration had significantly improved chewing muscle function after implant restoration. Among them, the fixed implant restoration group had slightly higher electromyographic and physiological activity of chewing muscles during upper and lower dentition occlusion than the natural dentition group.

2) Immediate restoration is beneficial for reducing tooth loss time and meeting aesthetic needs

With the promotion of immediate load mode, many patients can obtain a well-functioning fixed restoration in a short period of time after implantation, greatly reducing their waiting time and meeting their functional and aesthetic needs to a great extent. In addition, under the premise of achieving good initial stability of the implant, its short-term clinical efficacy and long-term prognosis are no less than traditional loading mode. Sommer et al. reviewed the marginal bone loss (MBL) of implants under different loading modes. One year after implant implantation, the immediate loading group had the least MBL, with an average of 0.457mm, the traditional load group had the highest edge bone loss, with an average of 0.852mm, indicating that immediate loading may be more beneficial for the stability of the implant edge bone. The patient in this case received temporary restorations within 24 hours after surgery, which greatly met the patient's functional and aesthetic needs and achieved high patient satisfaction.

3) The design of planting schemes and immediate repair are beneficial for reducing trauma

The purpose of inclined implantation of distal implants is to avoid important anatomical structures such as the maxillary sinus and mandibular nerve canal, allowing for longer implants to be implanted. The end of the implant can enter the denser anterior root apex area from the relatively osteoporotic posterior segment, which is beneficial for obtaining better initial stability, reducing the length of the distal cantilever, avoiding bone grafting, and immediate restorations. ^{12,13} In addition, if natural teeth remain, immediate implantation can be performed. After tooth replacement and extraction, the tilted implant can penetrate several layers of cortical bone composed of inherent alveolar bone to achieve good initial stability and avoid the situation of insufficient initial stability that often occurs when axial implantation is performed in the alveolar cavity. In addition, immediate weight-bearing is beneficial for reducing postoperative bleeding and swelling, and stimulating the jawbone faster. These measures are all aimed at reducing patient trauma while ensuring functionality, reflecting the healthcare professionals' awareness of injury. They can enable students to have a concrete understanding of how to consider the patient's needs and provide comprehensive care during the process of edentulous dental implant restoration.

4) The design plan should implement the entire lifecycle

Numerous studies have confirmed that implants can transmit the biting force experienced by dentures during chewing to the jawbone, providing functional stimulation and reducing alveolar bone resorption around the implant. In the study comparing the reconstruction of residual alveolar bone after implant supported dentures and full dentures, some scholars believe that implant supported dentures can help reduce the absorption rate of residual alveolar bone. Kordatzis et al. compared the reconstruction of residual alveolar bone after 5 years of restoration with two implant supported dentures and full dentures, and found that the absorption rate

of alveolar bone in the posterior jaw of patients with full dentures was more than twice that of patients with implant supported dentures. The clinical trial conducted by Jacobs et al. showed that compared to full dentures and implant supported dentures, implant supported fixed dentures can significantly reduce residual alveolar bone resorption in the posterior jaw. Reasonably designed implant supported restorations are beneficial for the long-term preservation of alveolar bone in edentulous patients, which is extremely important for some younger patients. Therefore, this case inspires students to consider the entire life cycle of patients during the treatment process, rather than being limited to a moment.

5) Multidisciplinary thinking

Oral implantology requires knowledge from disciplines such as oral and maxillofacial surgery, oral restoration, and periodontal disease, while edentulous implant supported dentures require the integration of multidisciplinary knowledge and thinking. Students should have multidisciplinary thinking in the process of learning and should not limit their thinking to a single subject.

6) Reduce patient expenses

On the premise of following the patient's subjective wishes and objective economic ability, strict control of contraindications, flexible selection of personalized repair plans, simplification of surgical procedures while considering clinical outcomes, in order to improve the patient's quality of life and increase the success rate of repair. In this case, the all-on-4 scheme was chosen for the upper jaw, which only requires the implantation of 4 implants to achieve fixed restoration of the edentulous jaw, reducing the patient's surgical trauma and costs.

3. This project solves key problems in traditional teaching

(1) Traditional teaching lacks attention and emphasis on the real needs of patients, resulting in students lacking awareness and ability to empathize and care for humanity.

(2) Traditional teaching lacks emphasis and practice on interdisciplinary collaboration, resulting in students lacking a comprehensive perspective and thinking on the diagnosis and treatment of edentulous dental implant restoration. Overcoming the limitations of vocational students' narrow perspectives, enabling them to break free from the thinking of "seeing what disease in what subject" and focus on a global perspective of disease diagnosis and treatment.

(3) Traditional teaching lacks awareness of the entire life cycle of patients, resulting in students lacking long-term thinking when choosing diagnosis and treatment plans.

(3) The effectiveness of educational reform

1. Student benefits: Through specific cases, learn to consider problems from the perspective of patients and truly implement the awareness of love and injury.

2. Teacher team building: Integrating clinical work with teaching, creating conditions for students to learn the diagnosis and treatment ideas of edentulous dental implant restoration from zero distance, and immersing students in cultivating their awareness of injury.

3. Course construction: Summarize clinical experience in teaching, elevate teaching thinking in clinical work, and continuously refine course content and form.

4. Textbook construction: Provide high-quality cases for the compilation of textbooks on edentulous dental implant restoration, promote the cultivation of injury awareness, and cultivate more future doctors with multidisciplinary thinking, height, and warmth.

5. Analysis

(1) The main content and conclusion of this article

In the teaching of edentulous dental implant restoration, we not only focus on imparting technical skills, but also emphasize the cultivation of "injury awareness". This kind of humanistic care not only enhances the patient's treatment experience, but also strengthens the trust relationship between doctors and patients.

(2) Characteristics and Innovation

1. Cultivation of injury awareness: Through real case analysis, help students understand the needs of patients and integrate injury awareness into clinical practice.

2. Cultivation of multidisciplinary thinking: Emphasis is placed on possessing multidisciplinary thinking and cultivating students' comprehensive diagnostic and treatment abilities.

3. Pay attention to the cultivation of patients' awareness of the entire life cycle: The formulation of diagnosis and treatment plans should have a long-term vision and focus on the entire life cycle of patients.

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