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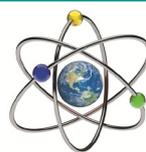
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- 13.00.00 Pedagogika fanlari
- 13.00.01 Pedagogika nazariyasi. Pedagogik ta'limotlar tarixi
- 13.00.02 Ta'lim va tarbiya nazariyasi va metodikasi (sohalar bo'yicha)
- 13.00.03 Maxsus pedagogika
- 13.00.04 Jismoniy tarbiya va sport mashg'ulotlari nazariyasi va metodikasi
- 13.00.05 Kasb-hunar ta'limi nazariyasi va metodikasi
- 13.00.06 Elektron ta'lim nazariyasi va metodikasi (ta'lim sohaları va bosqichlari bo'yicha)
- 13.00.07 Ta'limda menejment
- 13.00.08 Maktabgacha ta'lim va tarbiya nazariyasi va metodikasi
- 13.00.09 Ijtimoiy pedagogika
- 07.00.00 Tarix fanlari
- 19.00.00 Psixologiya fanlari
- 01.00.00 Fizika-matematika fanlari
- 02.00.00 Kimyo fanlari
- 03.00.00 Biologiya fanlari
- 09.00.00 Falsafa fanlari
- 10.00.00 Filologiya fanlari
- 11.00.00 Geografiya fanlari

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MECHANICAL DESTRUCTION OF A DENTAL IMPLANT

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Abstract: This article presents a clinical study of the causes leading to dental implant fractures, a severe complication in implant dentistry. The authors conducted a retrospective analysis of 21 cases involving middle-aged and elderly patients (40-70 years old) diagnosed with implant body fractures 5-8 years after prosthetic loading. The study demonstrates that implant failures are associated with several critical factors, including inappropriate implant diameter selection (3.5 mm in the molar region despite insufficient bone volume), delayed patient consultation following the onset of crown mobility, and bruxism. A significant correlation was observed between a prior abutment screw fracture and subsequent implant body failure occurring within 18-24 months after screw replacement. Intraoral periapical radiography was identified as the most effective diagnostic tool for detecting cracks and fractures. The findings emphasize the necessity of performing bone augmentation procedures prior to implantation to ensure the placement of appropriately sized implants. Furthermore, splinting short implants into a single orthopedic unit is recommended, particularly in the posterior regions of the maxilla. Collaborative treatment planning between surgeons and prosthodontists is recognized as a key factor in reducing lateral loading risks and preventing fatigue failure of metallic implant components.

Key words: dental implantation, implant fracture, complications, osseointegration, abutment screw, bone grafting, orthopedic rehabilitation, masticatory load.

Annotatsiya: Ushbu maqola denta implantologiyada uchraydigan jiddiy asoratlardan biri – implantatlarning sinishi sabablarini klinik jihatdan o'rganishga bag'ishlangan. Mualliflar 40-70 yoshdagi o'rta va katta yosh toifasiga mansub bemorlar orasida kuzatilgan 21 ta klinik holatni retrospektiv tahlil qilgan. Mazkur bemorlarda protezlashdan 5-8 yil o'tib implantat tanasining sinishi aniqlangan. Tadqiqot natijalari implantatlarning buzilishi bir nechta muhim omillar bilan bog'liqligini ko'rsatdi. Jumladan, molyar sohada suyak to'qimasi yetishmovchiligi sharoitida kichik diametrlil implantat (3,5 mm) qo'llanilishi, toj harakatchanligi paydo bo'lganidan so'ng shifokorga kech murojaat qilish hamda bruksizm (tishlarni siqish odati) mavjudligi asosiy xavf omillari sifatida qayd etildi. Shuningdek, ilgari fiksatsion vintning sinishi kuzatilgan bemorlarda vint almashtirilganidan keyin 18-24 oy davomida implantat tanasining qayta sinishi o'rtasida sezilarli bog'liqlik aniqlangan. Yoriqlar va sinishlarni aniqlashda eng samarali diagnostik usul sifatida og'iz ichi nishonli rentgenografiya e'tirof etildi. Tadqiqot implantatsiyadan oldin suyak plastikasini amalga oshirish zarurligini ta'kidlaydi, chunki bu mos o'lchamdagi implantatni joylashtirish imkonini beradi. Bundan tashqari, ayniqsa yuqori jag'ning orqa sohalarida qisqa implantatlarni yagona ortopedik blokka birlashtirish tavsiya etiladi. Jarroh va ortoped-shifokorlarning hamkorlikdagi davolash rejasini ishlab chiqishi yonlama yuklamalarni kamaytirish hamda metall implantat komponentlarining charchoqqa uchrash xavfini pasaytirishda muhim omil sifatida baholanadi.

Kalit so'zlar: denta implantatsiya, implantat sinishi, asoratlar, osteointegratsiya, fiksatsion vint, suyak plastikasi, ortopedik rehabilitatsiya, chaynash yuklamasi.

Аннотация: Эта статья посвящена клиническому изучению причин, вызывающих перелом имплантатов – серьезное осложнение в дентальной имплантологии. Авторы провели ретроспективный анализ 21 случая у пациентов среднего и старшего возраста (40–70 лет), у которых диагностировали перелом имплантатов через 5–8 лет после протезирования. Исследование показало, что поломки имплантатов связаны с несколькими факторами. Среди них: неподходящий диаметр имплантата (3,5 мм в области моляров при недостатке костной ткани), несвоевременное обращение к врачу при обнаружении подвижности коронки и наличие привычки сжимать зубы (бруксизм). Авторы особо подчеркнули зависимость между предыдущим переломом фиксирующего винта и последующим разрушением имплантата в период 18–24 месяцев после проведения ремонта. Диагностика трещин и переломов наиболее эффективно проводится с помощью внутриротовой прицельной рентгенографии. Исследование подчёркивает важность проведения костной пластики перед имплантацией для обеспечения размещения имплантатов соответствующего размера. Особое внимание уделяется необходимости объединения коротких имплантатов в единый ортопедический блок, что особенно актуально для боковых отделов верхней челюсти. Совместное планирование хирургических вмешательств, осуществляемое хирургами и ортопедами, признано ключевым фактором в снижении вероятности возникновения побочных нагрузок и износа металлических имплантатов.

Ключевые слова: дентальная имплантация, перелом имплантата, осложнения, остеоинтеграция, фиксирующий винт, костная пластика, ортопедическая реабилитация, жевательная нагрузка.

INTRODUCTION

Dental implant failure is a significant and irreversible complication arising from both the surgical and prosthetic stages of treatment. Addressing such issues may require implant removal, subsequent re-implantation after several months, placement of additional implants, or adjustments to the orthopedic structure. Although fracture of the dental implant wall is not among the most common complications, it can occur sometime after prosthesis installation.

LITERATURE REVIEW

Dental implant fractures represent a relatively rare yet clinically severe complication that may occur long after successful osseointegration and prosthetic loading. Although osseointegration has historically been considered the primary criterion for implant success, long-term mechanical stability is equally critical. According to Drobyshev and Dronov ^[1], resonance-frequency analysis remains an essential diagnostic method for evaluating implant stability and osseointegration; however, it does not reliably predict late-stage mechanical complications, including implant body fractures. Even though such fractures are uncommon, they constitute catastrophic failures that often necessitate complex bone grafting procedures and extensive explantation. Implant diameter and biomechanical considerations play a decisive role in preventing mechanical overload. Contemporary clinical standards recommend that implant diameter correspond to the anatomical dimensions of the tooth being replaced. Narrow-diameter implants (3.0–3.5 mm) are generally indicated for mandibular incisors or maxillary lateral incisors, whereas standard and wide-diameter implants (4.0–5.0 mm) are preferred in posterior regions subjected to higher masticatory forces. The placement of narrow-diameter implants (3.5 mm) in molar regions, particularly in cases of insufficient bone volume, has been identified in the literature as a significant risk factor, as it increases stress concentration in the cervical region of the implant and predisposes the metal structure to fatigue failure. Prosthetic design is another crucial determinant of mechanical longevity. Splinting, which unites multiple implants into a single orthopedic unit, is widely discussed as a strategy to reduce lateral forces and improve load distribution.

Kolesova et al. ^[4] emphasize that many orthopedic complications arise from improper biomechanical planning and uneven occlusal load transmission. In the posterior maxilla, especially following sinus lift procedures, splinting short implants (6 mm) is recommended to distribute occlusal forces more evenly and prevent overload of individual fixtures. Technical complications frequently originate at the level of the fixation screw. Screw loosening or fracture often serves as an early warning sign of progressive biomechanical stress. Clinical studies indicate that a substantial interval (18–24 months) may exist between fixation screw replacement and subsequent implant body fracture, suggesting that initial screw failure may reflect underlying mechanical fatigue that ultimately compromises the entire implant system. Diagnostic challenges further complicate timely detection. Computed tomography and orthopantomography, although routinely employed, often generate “metal flare” or “halo” artifacts that obscure minor structural defects in the implant wall. As noted by Dvorak et al. ^[2], once a fracture is confirmed, specialized explantation techniques are required. Intraoral radiography remains the gold standard for detecting microfractures due to its superior spatial resolution and reduced metallic interference.

Preventive strategies are therefore centered on comprehensive pre-operative planning within a prosthetically driven treatment concept. This approach includes bone augmentation procedures, such as grafting



or distraction osteogenesis, to ensure adequate alveolar width and height [3]; precise CT-based mapping of anatomical structures, including the maxillary sinuses and mandibular canal, to facilitate placement of implants with optimal diameter and length (1 mm accuracy); and the use of advanced titanium alloys and reinforced cervical designs, such as those employed in DENTSPLY systems, to enhance fatigue resistance and long-term structural integrity. Collectively, these biomechanical, prosthetic, and diagnostic considerations form the basis for understanding the multifactorial etiology of implant fractures and for developing evidence-based preventive recommendations.

RESEARCH METHODOLOGY

The study analyzed 21 clinical cases involving dental implant fractures. In each case, the crown was secured to the implant using a screw-retained design. Various implant systems were utilized, including Astra, MIS, Implantium, and "Divatal" zirconium implants. The duration from crown placement to the detection of implant fracture ranged from five - eight years. The patient cohort consisted of 10 women and 11 men, aged 40 - 70 years. All implants were located in the posterior regions of the jaws, replacing molars. Four implants were placed in the mandible (lower jaw) and three in the maxilla (upper jaw). Six implants functioned as standalone structures, while one damaged element located near two other implants in the maxilla was not integrated into a common splinted structure. Various diagnostic methods are used to identify dental implant damage, including clinical examination and radiographic imaging (orthopantomography, computed tomography). However, the latter may be less effective in detecting implant fractures due to metal flare artifacts. The most informative method is targeted intraoral radiography focused on the area of the damaged implant. Patients most frequently complain of prosthetic mobility or spontaneous detachment.

The study focused on the analysis of cases involving the failure of single implant-supported crowns, as well as crowns on adjacent implants that were not splinted into bridge-like structures. Medical history analysis revealed that, in every case of premature structural failure, crown mobility had been observed for a period ranging from several weeks - several months. Two cases of implant fracture were preceded by fixation screw fracture. Between one - one and a half years prior to the discovery of the implant fracture, surgeons performed procedures to remove damaged fixation screws using ultrasonic instruments, dental microscopes, microsurgical tools, and specialized broken screw retrieval kits. In some cases, these kits allowed restoration of the internal threads of DENTSPLY implants. After removal of the fixation screw and confirmation of the integrity of the internal implant components, the prosthesis was re-secured with a new screw at a torque of 28 N·cm. Follow-up evaluations were conducted at four weeks and six months using a calibrated torque wrench.

ANALYSIS AND RESULTS

Clinical observations demonstrated that implant fractures were recorded 18 - 24 months after replacement of the damaged screws. Fractures of single implants were more frequent. When determining implant diameter, manufacturer guidelines must be strictly followed. The choice of diameter depends on the location and type of tooth being replaced. For mandibular incisors and maxillary lateral incisors, a 3.0 mm diameter implant is considered optimal. Frontal teeth and premolars of both jaws are suitable for 3.5 mm implants. For maxillary and mandibular molars, implants with diameters of 4.0, 4.5, or 5.0 mm are recommended. It is advisable that implant length be at least 9 mm, particularly in posterior regions. In cases involving short implants (6 mm), splinting them into a single orthopedic unit is recommended if they are in close proximity. This approach is particularly appropriate for the maxilla, especially following sinus lift procedures. However, exceptions may occur due to non-parallel implant placement, improper installation, or specific clinical constraints.

Factors contributing to mandibular implant fractures included delayed patient follow-up after detection of mobility, incorrect selection of implant diameter (3.5 mm) for first and second molar regions due to insufficient bone volume, and uneven distribution of masticatory load. In the maxilla, two principal factors contributed to fracture: a prior fixation screw break 1.5 years earlier and failure to follow orthopedic recommendations regarding splinting of adjacent implants. One patient presented with bruxism and used a muscle-relaxation splint (night guard).

CONCLUSION

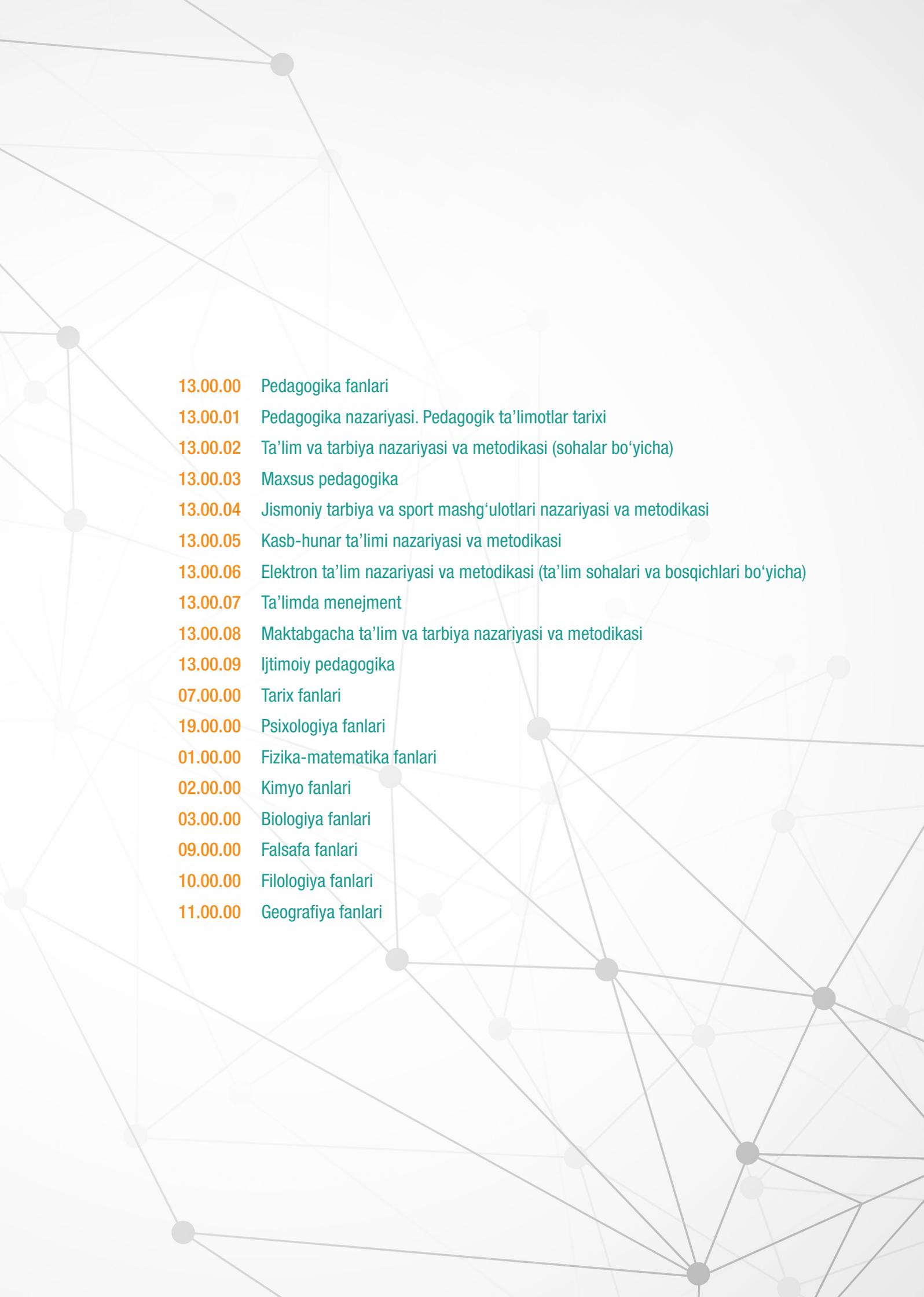
Prior to surgery, a comprehensive patient examination is recommended, including a detailed medical history and identification of comorbidities. An orthopedic surgeon must be involved in the treatment-planning process. Computed tomography (CT) is a vital step in accurately determining bone volume and analyzing surrounding anatomical structures (maxillary sinus, nasal cavity, mandibular canal, mental foramen). In cases of limited bone volume, bone grafting is recommended prior to implantation. This ensures successful placement

and allows for the selection of an implant that optimally matches the dimensions of the specific dental zone. To prevent lateral loading on implants placed after a sinus lift, integration into a single orthopedic system is required ^[4].

This is especially critical for short implants in the maxilla. To compensate for limited diameters (3.0 and 3.5 mm), it is recommended to increase implant length to 11 mm or more. Some manufacturers are modernizing implant designs by thickening the metal neck (DENTSPLY) and using new titanium alloys to reduce fracture risks. Specialized training for oral surgeons and prosthodontists is necessary to increase awareness of potential complications in dental implantation.

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- 13.00.00 Pedagogika fanlari
 - 13.00.01 Pedagogika nazariyasi. Pedagogik ta'limotlar tarixi
 - 13.00.02 Ta'lim va tarbiya nazariyasi va metodikasi (sohalar bo'yicha)
 - 13.00.03 Maxsus pedagogika
 - 13.00.04 Jismoniy tarbiya va sport mashg'ulotlari nazariyasi va metodikasi
 - 13.00.05 Kasb-hunar ta'limi nazariyasi va metodikasi
 - 13.00.06 Elektron ta'lim nazariyasi va metodikasi (ta'lim sohaları va bosqichlari bo'yicha)
 - 13.00.07 Ta'limda menejment
 - 13.00.08 Maktabgacha ta'lim va tarbiya nazariyasi va metodikasi
 - 13.00.09 Ijtimoiy pedagogika
 - 07.00.00 Tarix fanlari
 - 19.00.00 Psixologiya fanlari
 - 01.00.00 Fizika-matematika fanlari
 - 02.00.00 Kimyo fanlari
 - 03.00.00 Biologiya fanlari
 - 09.00.00 Falsafa fanlari
 - 10.00.00 Filologiya fanlari
 - 11.00.00 Geografiya fanlari



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