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Basal Implants: A Narrative Review

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Abstract:
Basal Implants Are A Relatively New Type Of Dental Implant That Offer Several Advantages Over Conventional Implant Systems. These Implants Are Designed To Be Placed In The Basal Bone, Which Is Denser And More Stable Than The Conventional Bone In The Jaw. Recent Advances In Basal Implants Have Focused On Improving Their Design, Materials, And Surgical Techniques. For Example, Newer Implants Are Made From Stronger And More Biocompatible Materials, Such As Titanium Alloys And Zirconia. These Materials Can Promote Better Osseointegration, Which Is The Process By Which The Implant Fuses With The Surrounding Bone Tissue. In Addition, Advances In Surgical Techniques Have Allowed For More Precise And Minimally Invasive Implant Placement. This Has Therefore Reduced The Risk Of Complications, Shortened Recovery Times, And Improved Overall Patient Outcomes. Another Notable Advancement In Basal Implants Is The Use Of Computer-Aided Design And Manufacturing (CAD/CAM) Technology. This Technology Allows For The Creation Of Custom Implants That Are Tailored To The Patient's Unique Anatomy, Resulting In Better Fit And Improved Function. Hence, These Advances In Basal Implants Have Made Them An Increasingly Popular Choice For Patients With Complex Dental Needs Or Those Who Are Seeking A More Permanent And Stable Tooth Replacement Option. This Review Aims To Summarize The Current Advances In The Field Of Basal Implantology.
Key-Words: *Basal Implants, One-Piece Implants, Cortical Bone*

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I. Background:

The basal bone is very strong and hence constitutes the stress bearing part of our skeleton. Dental Implants when placed in this bone can be loaded with a prosthesis immediately (within 72 hours) and can therefore avoid the need for a 2nd surgery to fix the abutment. Moreover, this innovative procedure precludes the use of bone grafting/augmentation thus making it a minimally invasive procedure. This science of immediate weight bearing on implants is already proven in orthopedic implants like the hips/knees. A need for a similar detailed study with a prolonged follow-up is essential for the acceptance of dental basal implants. Presently, implant treatment has now become the gold standard in replacing missing tooth(1,2). In cases of severe alveolar resorption, implant placement especially below the maxillary sinus still remains a challenge in dental implantology(1,3). The posterior maxilla very often provides limited bone height and poor bone quality which compromises the primary stability of the implant. Moreover Maxillary sinus pneumatization can complicate this problem(1,4-6). The conventional Maxillofacial therapy consists of bone grafting from either the hips tibia ribs or chin in combination or prior to impant insertion(1). These procedures were initially presented by Tatum et al. in the 1970s and first published by Boyne &James1980. In1994, Summers introduced the osteotome sinus floor elevation via a crestal and flapless approach(1,5,7,8). But bone augmentation procedures are associated with a number of disadvantages. It requires two independent invasive surgeries, that cause not only a prolongation in treatment time, but also additional costs and discomfort for the patients(3,9-11). Moreover, it's never proved that augmentation procedure make dental implant treatments safer. Many Post-operative complications are reported in literature such as wound dehiscence, acute and chronic sinusitis, mucocele formation, swelling, loss of graft material into the sinus causing disruption of normal physiological sinus function, and graft infection(7,12,13). Also in certain cases, where treatment needs to be attempted, to resolve a situation after the failure of an all-on-four-type construction (conventional implants), the patient will not typically opt to have another multistage surgical procedure such as an extensive bone-block transplant followed by conventional two stage implants again since it would be too

expensive. Therefore, as a minimally invasive alternative, treatment with immediate loading implant surgery and achieving masticatory function becomes a priority(14).

Basal Implants have demonstrated excellent results in controlled diabetics, in smokers, in chronic destructive periodontitis and in patients who have little or no bone for conventional implants (Table 1 and 2). Furthermore, the smooth surface design of these implants prevent bacterial colonization (prevents retrograde infection). So part of this smooth polished implant can stay in the maxillary sinus or above the nasal floor without the risk of infection thus assigning a 98% lesser chances of peri-implantitis and hence lower failure rates. There is a current lack on these kind of long term studies globally and most of the published studies are in German or French. Not a single long term study has been conducted here in India. It's an answer to the hopeless and rejected patients that do not qualify for conventional implants and hence have no chance of an improved existence with a full set of teeth and facial profile. Furthermore, evaluating bone condition is essential in the pre-operative stage and during the follow-up stage after implant placement. In this sense, Imaging techniques are relaible tools for evaluating peri-implant tissue. A 3-dimensional visualization of the bone is required wherein a conventional and cone beam computed tomography (CBCT) is the modality of choice. Recently, CBCT scans have also been studied for their ability to noninvasively measure the thickness of palatal mucosa in different locations, and have been found to be accurate. A comparative analysis of imaging techniques done for diagnostic accuracy of peri-implant bone defects showed CBCT to be a clinically acceptable performance for assessing these bone defects. For assessment of mechanical bone quality also, CBCT shows similar results as compared to other available methods. Via this, we will be able to check for changes in the bone visible with the help of successive CBCT scans compared over a stipulated period of time and we will be able to create evidence of this new science.

Difference between conventional and basal dental implants:

Conventional dental implants have been used successfully for several decades to replace missing teeth. However, with the advent of basal implants, a new option has emerged for patients with poor bone quality, systemic diseases or those who are not suitable for conventional implants. Here, we will discuss the differences between conventional implants and basal implants.

Implant design:

Conventional implants have a cylindrical or tapered shape and are placed in the bone using a two-stage surgical technique. Basal implants, on the other hand, have a unique design with a wider base and a tapered shape. They are placed in the basal bone using a one-stage surgical technique.

Bone anchorage:

Conventional implants rely on osseointegration for stability, which means they need a certain amount of bone mass and quality to achieve adequate anchorage. Basal implants, on the other hand, rely on cortical bone anchorage and can achieve stability in poor quality bone.

Surgical technique:

Conventional implant placement requires a two-stage surgical technique with a waiting period of 3-6 months before the prosthetic restoration can be placed. Basal implants, on the other hand, use a one-stage surgical technique and can be loaded immediately after placement.

Prosthetic options:

Conventional implants can support a variety of prosthetic options such as single crowns, bridges or dentures. Basal implants, on the other hand, are designed primarily for full arch restorations with a minimum of four implants.

Success rate:

The success rate of conventional implants has been well-documented in the literature and ranges from 95-98%. The success rate of basal implants is also high, with reported success rates ranging from 92-98%.

Bone preservation:

Conventional implants require a certain amount of bone preparation and may lead to bone loss over time. Basal implants, on the other hand, preserve bone and may even stimulate new bone growth.

In conclusion, both conventional and basal implants have their advantages and disadvantages. Conventional implants are a reliable option for most patients with adequate bone quality, while basal implants are a viable option for patients with poor bone quality or systemic diseases. While conventional implants offer a wide range of prosthetic options, basal implants are designed primarily for full arch restorations. Ultimately, the choice between conventional and basal implants depends on individual patient factors, and a thorough evaluation by a

dental professional is necessary to determine the best option for each patient.

History of basal implants:

First single-piece implant was developed and used by **Dr. Jean-Marc Julliet in 1972**. Since no homologous cutting tools were produced for this implant, its use was fairly demanding. In the mid-1980s French dentist, Dr. **Gerard Scortecci**, invented an improved basal implant system complete with matching cutting tools. Together with a group of dental surgeons, he developed the Disk-implants. Since the mid-1990s, a group of dentists in Germany have developed new implant types and more appropriate tools, based on the Disk-implant systems. These efforts then gave rise to the development of the modern BOI (Basal Osseointegrated Implant or lateral basal implants. In this design, load transmission was supposed to take place both in the vertical and in the basal implant part. Soon **Dr.Stefan Ihde** introduced bending areas in the vertical implant shaft. In 2005 the lateral basal implants were modified to screwable designs (BCS) (15). Screwable basal implants (BCS® brand) are flapless implants and are placed through gum, without an incision. It's a one piece basal screw implant in which the cortical load transmission is done through the large basal threads. Those threads should be anchored in the cortical plate opposite to the crest. Some BCS implants provide lengthy holes or grooves in the threads for the in-growth of vessels or bone. Load transmission along the polished vertical shaft is not required for the functioning of this implant-type. They feature some structural elasticity and they have in common that masticatory loads are transmitted into the basal bone and into resorption free bone areas. It's based essentially on the principle of bicortical stabilization with consequent protection of the healing processes. For use as Zygoma-Implants, an aggressive thread for zygomatic anchorage and a bending zone near the abutment is designed. The bending zone allows insertion from the palatal aspect of the maxillary alveolar crest and subsequent bending of the implant. This way, the head reaches the crest and fits under the prosthetic construction(15).

Several authors have recommended basal implant and bicortical implant anchorage (crestal bone and sinus floor) to get implant stability so implants may penetrate into the nasal and maxillary sinus cavity(1,16-19).The smooth surface of the BCS implants permits a fast soft tissue attachment around the implant. The seal of this attachment which is based on difference in the penetration depths and new regenerated bone surrounding the thread of all the implants leading to increase bone implant contact is observed.

Khairnar and Gaur(20) reported that there was significant bone formation after indirect lifting of the nasal membrane with smooth polished surface of bi-cortical implants and that very good primary stability of the implant is obtained by means of its bicortical support.

Zhong et al(4) et al stated that higher removal torque values and greater bone-to-implant contact has been reported for bi-cortically anchored implants in rabbits. Moreover, Zhong et al, reported that a surgically disrupted membrane around the apical portion of an implant healed again and covered the tips of the implants provided the protruding depth is less than 2mm.

Jung et al(21-24) reported that the implants penetrating into the sinus floor less than 2mm were covered by the sinus mucosa in mongrel dogs. Scans showed that implant protrusion of more than 4mm in the maxillary sinus can cause thickening of the sinus mucosa around the implants. However these sinuses remained asymptomatic(1,25,26).

Computed tomography was available for 3-dimensional dental imaging in the 1980s, but due to the high cost, limited access, and radiation exposure, utilization was limited to management of craniofacial anomalies, complex surgeries, and other unique dental situations. In 1988, cone beam computerized tomography (CBCT) was introduced to dentistry. This technology offered 3-dimensional visualization and more complex and more accurate imaging compared to analog and digital radiographs. CBCT is an accurate and useful tool for many clinical oral-maxillofacial indications, including the identification of anatomical structures and locations prior to implant placement and other oral surgery procedures, prior to and during endodontic procedures and when planning treatment for orthodontics.

Characteristics:

Basal implants are a type of dental implant that has been developed to address the challenges of conventional implants in patients with poor bone quality or quantity. Basal implants have gained popularity due to their unique design and high success rate. In this literature review, we will discuss the characteristics of basal implants.

Implant design:

Basal implants have a unique design that differs from conventional implants. Basal implants have a wider base and a tapered design, which allows for immediate stability and anchorage in cortical bone. The implant design also allows for immediate loading and osseointegration.

Basal implants are a type of dental implant that has been developed to address the challenges of

conventional implants in patients with poor bone quality or quantity. The implant design of basal implants plays a critical role in their success rate and clinical outcomes. In this literature review, we will discuss the implant design of basal implants.

a) Tapered design:

Basal implants have a tapered design that allows for better anchorage in cortical bone. The tapered design also allows for better stress distribution and reduces the risk of implant failure. The implant design also allows for immediate stability and anchorage in cortical bone, which allows for immediate function and osseointegration.

b) Wide base:

Basal implants have a wider base compared to conventional implants. The wider base provides better stability and anchorage in cortical bone, which reduces the risk of implant failure. The wider base also allows for better stress distribution and reduces the risk of bone loss.

c) Bicortical anchorage:

Basal implants rely on bicortical anchorage for stability and anchorage. The implant is placed in a way that it is in contact with both the cortical and cancellous bone, which provides better stability and anchorage. Bicortical anchorage also allows for better stress distribution and reduces the risk of implant failure.

d) Immediate loading:

Basal implants allow for immediate loading and osseointegration. The immediate loading of basal implants reduces the treatment time and cost for patients and allows for immediate function. The implant design of basal implants allows for immediate stability and anchorage in cortical bone, which allows for immediate loading.

e) Biocompatible materials:

Basal implants are made of biocompatible materials such as titanium, zirconia or ceramic. These materials have been shown to be safe and effective for dental implant placement and have a high degree of osseointegration.

f) Single-piece design:

Basal implants have a single-piece design that eliminates the need for abutments. The single-piece design reduces the treatment time and cost for patients and allows for better stress distribution. The single-piece design also reduces the risk of implant failure and bone loss.

Overall, the implant design of basal implants plays a critical role in their success rate and clinical outcomes. The tapered design, wide base, bicortical anchorage, immediate loading, biocompatible materials, and single-piece design of basal implants allow for better stability, anchorage, stress distribution, and reduced treatment time and cost for patients. The early clinical outcomes of basal implants are promising, and more long-term studies are needed to evaluate the clinical outcomes and effectiveness of basal implants.

Biocompatible materials:

Basal implants are made of biocompatible materials such as titanium, zirconia or ceramic. These materials have been shown to be safe and effective for dental implant placement and have a high degree of osseointegration. Basal implants are a relatively new type of dental implant that are inserted into the basal bone of the jaw. They have been gaining popularity due to their unique design, which allows for immediate loading and high stability, even in cases of severe bone loss. However, to ensure the long-term success of basal implants, biocompatible materials must be used(27). Biocompatible materials are those that can be used in the body without causing any harmful effects or rejection by the immune system. In the case of basal implants, the materials used must be able to integrate with the surrounding bone tissue and provide a stable foundation for the implant. One of the most commonly used biocompatible materials in basal implants is titanium. Titanium is a strong, lightweight metal that is highly resistant to corrosion and has excellent biocompatibility. It is commonly used as the material for the implant post, as well as for the abutment and crown. Another biocompatible material used in basal implants is zirconia. Zirconia is a type of ceramic that is highly resistant to wear and has a similar appearance to natural teeth. It is often used for the abutment and crown, as it provides a natural-looking and highly aesthetic result. In addition to titanium and zirconia, other biocompatible materials that have been used in basal implants include tantalum, niobium, and various bioceramics. Tantalum and niobium are both highly biocompatible metals that are used in medical implants due to their excellent corrosion resistance and low toxicity. Bioceramics, such as hydroxyapatite and tricalcium phosphate, are also highly biocompatible and can be used to promote bone growth around the implant.

Several studies have investigated the use of different biocompatible materials in basal implants. One study compared the use of titanium and zirconia abutments in basal implants and found that both materials had similar success rates and clinical outcomes over a five-year follow-up period. Another study compared the use of titanium and tantalum implants and found that both materials had similar levels of osseointegration and stability(28,29).

Overall, biocompatible materials play a critical role in the success of basal implants. Titanium and zirconia are the most commonly used materials, but other options, such as tantalum and bioceramics, may also be suitable. Further research is needed to fully understand the long-term performance of these materials in basal implants.

Cortical bone anchorage:

Basal implants rely on cortical bone anchorage for stability and anchorage. Cortical bone is denser and stronger than cancellous bone, which allows for better osseointegration and reduces the risk of implant failure. Basal implants are placed in a way that they are in contact with the cortical bone, which provides stability and anchorage.

Basal implants are a type of dental implant that differs from traditional implants in their placement and the use of cortical bone anchorage. Cortical bone anchorage refers to the anchoring of the implant in the cortical bone, which is the dense outer layer of bone that surrounds the inner spongy bone. In this literature review, we will discuss the role of cortical bone anchorage in basal implants and its effectiveness(30,31).

Cortical bone anchorage is one of the main features of basal implants, and it is thought to provide greater stability and support compared to traditional implants that are placed in the spongy bone. Several studies have shown that cortical bone anchorage results in a higher success rate and better implant stability compared to traditional implants. A study by Ihde et al. (2010) reported a success rate of 97.8% for basal implants anchored in the cortical bone, which is higher than the reported success rate for traditional implants.

In addition to providing greater stability, cortical bone anchorage also allows for immediate loading of the implant, which means that a crown or bridge can be placed on the implant shortly after placement. This is possible because cortical bone has a higher density and is more resistant to stress compared to spongy bone, making it more capable of supporting immediate loading.

However, cortical bone anchorage also has some disadvantages. One of the main challenges of cortical bone anchorage is the limited amount of cortical bone available in certain areas of the jaw, particularly in the posterior mandible. This can make it difficult to place the implant in the optimal position, leading to a higher risk of implant failure. Additionally, there is a risk of cortical bone resorption, which can occur if the implant is not properly positioned or if there is a lack of proper occlusal loading.

Several techniques have been developed to overcome these challenges and optimize cortical bone anchorage in basal implants. One such technique is the use of angled implants, which allow for better placement in areas with limited cortical bone. Another technique is the use of bicortical anchorage, which involves anchoring the implant in both the cortical and spongy bone layers for increased stability.

One-stage surgical technique:

The surgical technique for basal implants is a one-stage surgical technique. The implant is placed directly into the basal bone with minimal bone preparation. The one-stage surgical technique reduces the treatment time and cost for patients and allows for immediate function and osseointegration.

Immediate loading:

Basal implants allow for immediate loading and osseointegration. The immediate loading of basal implants reduces the treatment time and cost for patients and allows for immediate function. The immediate loading also reduces the risk of implant failure and bone loss.

Immediate loading has several advantages over delayed loading, which is the traditional approach where a crown or bridge is placed on the implant several months after placement to allow for osseointegration. One of the main advantages of immediate loading is that it reduces the treatment time for the patient. Patients can receive their new teeth on the same day as implant placement, which is a significant improvement over traditional implants that require several months of healing before the final restoration can be placed.

Several studies have evaluated the effectiveness of immediate loading in basal implants. A study by Ihde et al. (2010) reported a success rate of 97.8% for basal implants with immediate loading. Another study by Maló et al. (2011) reported a success rate of 98.4% for immediate loading of full arch implant-supported fixed prostheses. These results demonstrate that immediate loading can be a successful approach for basal implants.

However, immediate loading is not without its challenges. One of the main challenges is ensuring proper implant stability to support immediate loading. A study by Degidi et al. (2013) reported that implant stability was a key factor in the success of immediate loading in basal implants. Proper implant placement, surgical technique,

and implant design are all important factors in achieving adequate implant stability for immediate loading.

Another challenge of immediate loading is the risk of implant failure due to excessive loading or occlusal forces. Proper occlusal adjustments and patient education are important to prevent implant failure due to excessive forces.

In conclusion, immediate loading can be a successful approach for basal implants, providing several advantages over traditional delayed loading. However, proper implant stability and occlusal adjustments are critical to ensuring success. Further research is needed to evaluate the long-term effectiveness of immediate loading in basal implants and to optimize implant placement and surgical techniques to achieve optimal implant stability.

Prosthetic options:

Basal implants are designed primarily for full arch restorations. The prosthetic options include fixed prostheses such as bridges, hybrid prostheses, or removable prostheses such as overdentures. The prostheses can be supported by as few as four implants, which reduces the treatment time and cost for patients.

In conclusion, basal implants have unique characteristics that differentiate them from conventional implants. The wider base and tapered design of basal implants allow for immediate stability and anchorage in cortical bone. The one-stage surgical technique, immediate loading, and prosthetic options of basal implants allow for reduced treatment time and cost for patients. The early clinical outcomes of basal implants are promising, and more long-term studies are needed to evaluate the clinical outcomes and effectiveness of basal implants.

Replacement of the lost tooth post extraction is important in order to restore chewing ability, function and aesthetics. Moreover, it also affects the psychological and self-esteem of a person. Furthermore, the bone in the extracted socket begins to resorb post extraction in the event that the missing tooth is not replaced. Hence, the prevention of bone loss can be achieved via the placement of dental implants.

Placing conventional implants implies that the procedure can last anywhere between three to twelve months along with several appointments with the dentist in order to complete the entire process. Yet, when appropriate, immediate implants can help shorten the total treatment period and reduce the overall number of visits thus benefitting the patient. Immediate implant placement and immediate loading is when an implant is placed at the same time as the natural tooth is extracted, thus resulting in a single visit appointment where the extraction and implant placement is done at the same time hence resulting in the reduced inconvenience towards the patient. Immediate implants was introduced with the concept of seeking to assist patients who want to be treated in an efficient and expedient manner. Patients who when seeking a solution, prefer a safe and effective treatment that can be performed in the shortest possible time and with as little pain and discomfort as possible. These implants engage mechanically into the cortical bone and do not require osseointegration unlike conventional implants and hence there is no need for bone grafts in these cases. There are many long term follow up studies (>10 days) since 1976 that have reported its success and high survival. In suitable cases, the immediate placement of the implant and its immediate loading offer several benefits to the patients that include shorter treatment time and significantly reduced time. Since the procedure occurs within a span of 3 days, it can help restore aesthetics immediately and can therefore offer a suitable solution for high patient satisfaction, when clinically indicated. In immediate loading, it excludes the use of bone grafting procedures and complex surgical intervention that may otherwise be required in cases of resorbed ridges. The one-stage technique offers a simplified surgical workflow and requires only one surgery instead of two. The basal implants get their anchorage from the basal bone whereas conventional implants gets their anchorage from the alveolar bone. Since the BCS implants are thin and smooth they are perfect design to perform flapless key hole implant placement (without opening the gum). This is called Minimally Invasive Implant Dentistry or Keyhole dental implants. Moreover, these implants can be placed into fresh extraction sockets even if the extracted tooth was highly decayed and resulted into an abscess or if the tooth was extremely mobile. Immediate implants can also be placed in smokers as well as patients with controlled diabetes. These implants can also be immediately loaded within a period of 3-5 days since they heal in a better way when they are loaded immediately with the close collaboration between an oral surgeon, prosthodontist and lab technician.

Types of basal implants:

There exist two types of basal implants, namely BOI (Basal Osseo Integrated) and BCS (Basal Cortical Screw) that are placed into the strong cortical bone, while BCS is screwable with a thread diameter of upto 12mm and is placed into sockets immediately after extraction, BOI is generally inserted into the jaw bone via the lateral aspect. In these implants, the masticatory load transmission is confined to the cortical bone structures and the accompanying horizontal implant segments. Anterior Implants: Owing to the availability of vertical space, the implants used in the anterior region are with two disks that have a diameter of 9 or 10 mm and the crestal disk has a diameter of 7 mm. The crestal and basal plate of multi-disc implants have different functions. The main purpose of the crestal plate is to provide supplementary support to the implant. The emphasis of crestal plate is lost once

the basal plate has ossified to full load. The double disks are not inserted due to the lack of sufficient bone as it 16 leads to failure. A single BOI with a diameter of 7 to 9 mm and shafts between 8 to 13.5 mm can be used instead. Posterior Implants: Square shaped basal implants are used in the posterior region that have a disk diameter of 9 to 12 mm or 10 to 14 mm with shafts of 10 to 13.5 mm in length, depending on the available horizontal bone.

BCS: The screw basal implants are flapless implants that are inserted through the gingiva, without giving a single cut, inserted like a conventional implant. Bicortical screws (BCS) are also considered basal implants, as they transmit masticatory loads deep into the bone, usually onto the opposing cortical bone. The screw basal implants provide initially some elasticity and they are not prone to peri-implantitis due to the highly polished surface and thin mucosal penetration diameter.

Applications of Basal implants:

Basal implants are versatile and can be used in a variety of applications, including:

Full-arch restoration: Basal implants can be used to support a full arch of teeth, either on the upper or lower jaw. This is particularly useful in cases where patients have lost all or most of their teeth.

Single-tooth replacement: Basal implants can be used to replace a single missing tooth. This is a good option for patients who cannot have traditional implants due to lack of bone density or volume.

Multiple teeth replacement: Basal implants can be used to replace multiple missing teeth, either with individual implants or with implant-supported bridges.

Immediate loading: Basal implants are designed to allow immediate loading, which means that a crown or bridge can be placed on the implant right after surgery. This can reduce the overall treatment time for patients.

Orthodontic anchorage: Basal implants can be used in orthodontics to anchor braces or other orthodontic appliances.

Overall, basal implants are a reliable and effective solution for patients with limited bone volume or density in the jaw, and they offer a range of applications for different types of dental restorations. However, as with any dental procedure, it is important to consult with a qualified dentist or oral surgeon to determine if basal implants are the right option for your individual needs.

Indications of basal implants:

1. In circumstances when several teeth are missing and there is a need to extract them.
2. When a bone augmentation or bone regneration procedure has failed.
3. Incidences of thin ridges where there is a deficiency of bone in the buccolingual region
4. where bone height is generally not sufficient

Contraindications of Basal Implants:

1. Medical conditions: A recent history of myocardial infarction (heart attack), Cerebrovascular stroke, Immunosuppression would compromise the body and immune system thus precluding the placement of basal implants.
2. Patients who are on anti-cancer medication or on blood clotting medications do not meet the criteria for basal implant placements.

Rationale for using Basal Implants:

Basal implants, also known as basal osseointegrated implants, are a type of dental implant that utilizes the cortical bone as the primary anchorage for support. This type of implant has gained popularity over the past few decades due to its high success rates, minimal invasiveness, and ability to support immediate loading. In this literature review, we will explore the rationale behind using basal implants and the advantages they offer over traditional implant systems.

Bone quality and quantity: Basal implants are designed to be placed in the cortical bone, which has higher density and strength compared to the trabecular bone. This allows for immediate loading of the implant, which means that a patient can receive a fixed prosthetic restoration soon after the implant is placed. Additionally, basal implants can be used in cases where there is insufficient bone volume, such as in cases of severe resorption or in patients with a history of failed implant treatments (17,18,33).

Reduced invasiveness: Basal implants are typically placed using a minimally invasive approach, which involves a small incision and minimal bone removal. This reduces postoperative pain, swelling, and the risk of complications associated with traditional implant surgery.

High success rates: Basal implants have been shown to have high survival rates and low complication rates. A systematic review and meta-analysis of 17 studies involving 1163 patients showed a cumulative survival rate of 96.3% after 5 years and 91.1% after 10 years.

Immediate loading: Basal implants are designed to support immediate loading, which means that a patient can receive a fixed prosthetic restoration soon after the implant is placed. This eliminates the need for a temporary restoration and reduces the treatment time(34,35,36).

Cost-effective: Basal implants can be a cost-effective alternative to traditional implant systems, especially in cases where multiple implants are needed.

In conclusion, basal implants offer several advantages over traditional implant systems, including reduced invasiveness, high success rates, and the ability to support immediate loading. They can be a viable treatment option for patients with insufficient bone volume or those who require multiple implants. However, proper patient selection, implant placement, and follow-up care are crucial for long-term success.

Advantages of Basal Implants

1. One piece implant – Basal implants are generally a single-piece implant which ensures the minimization of the failure of the implant due to interface problems between the connections that exist in conventional two and three piece implants.
2. Basal cortical bone – These implants acquire support from the basal bone which is generally more resistant to resorption unlike the crestal bone, where the conventional implants are anchored. Besides, cortical bone has a greater regenerative capacity when compared to the crestal bone and hence can be of value in compromising conditions.
3. Additional surgeries: Since basal implants are anchored in the basal bone and not in the crestal bone, there precludes the need for additional surgery such as Bone augmentation / grafting, sinus lifting and nerve transpositioning procedures. On the other hand, in conventional implants, it requires the use of sinus life, soft or hard tissue guided regenerative procedures and second surgery for implants.
4. Implant load distribution: Implant load is safely transmitted to the free basal bone, while in conventional root form, there is a risk for bacterial attack.
5. Peri-implantitis: There is negligible risk for peri-implantitis or peri-implant disease because of the polished surfaces in basal implants.
6. Loading protocol: Immediate loading can be performed in a basal implant. There is no edentulous phase and no need for immediate dentures.
7. Reduced appointments: Extraction and implant placement can be simultaneously done in a single appointment, even if there was a previous or current periodontal disease.
8. Better distribution of masticatory forces: The basal implants are imbedded in high quality basal bone. Hence, the masticatory forces get distributed to the cortical bone areas that are highly resistant to resorption and have a very high repairing capacity.
9. Medically compromised situations – Basal implants work well in controlled diabetics, in smokers and patients suffering from chronic periodontitis.

Disadvantages of Basal implants:

1. It is always advisable to keep a few more extra implants handy to avoid extensive planning including three dimensional exploration of bone conditions.
2. The technique is pretty complex and it poses substantial challenges, for instructors and users alike, as far as the surgical and prosthetic treatment stages substantial knowledge requirements in the fields of biomechanics and bone physiology are concerned.

Complication Of Basal Implants:

Functional overload osteolysis: Masticatory forces transmitted through the basal implants may create local microcracks in the cortical bone. These microcracks are repaired by formation of secondary osteotomes, a process called as remodelling. However, this temporarily reduces the degree of mineralization and increases the porosity of the affected bone. Hence, basal implants have a good chance of reintegration, if loads are reduced to an adequate amount.

Table 1

Indications and contraindications of basal implants:

Indications	**Contraindications**
1. when several teeth are missing or extraction of several teeth have been indicated	1. Medical related diseases/ conditions: Several diseases and conditions prevent the use of implants that are not limited to a myocardial infarction (heart attack) or cerebrovascular accident (stroke), immunosuppression (a reduction in the efficacy of the immune system)

Indications	**Contraindications**
2. When two-stage implant placement process or bone augmentation has failed or not demonstrated expected results	2. Medications: Certain drugs or medications such anti-cancer drugs, blodd thinners and bisphosphonates like alendronate,zolendronate that are administered for the treatment of osteoporosis preclude the use of dental implants.
3. Bone atrophy i.e. in case of knife edged, thin ridges, insufficient bucco-lingual thickness or insufficient bone height	

Table 2. Comparison between basal and conventional implants:

Category	Basal Implant	Conventional Implant
Indications	Can be placed in extraction sockets immediately for multiple unit restorations	Ideally placed in single or multiple-unit restorations only in regions where there is adequate bone height
Loading	Can be immediately loaded within 72 hours	Delayed loading between 3-6 months
Corticalization	Corticalization is precluded in these procedures owing to the established of primary stability because these thin screw implants possess a cortical anchorage thus disseminating the forces along the vertical surface of the basal implants.	A bone-hard tissue interface is created between the implant and the bone ,excluding the presence of the soft tissue
Surgery	These procedures are generally flapless and are more time-efficient as compared to bridgework.	These procedures are generally more complicated and often require 3-4 sittings over an extensive period of 3-6 months.
Cost	These procedures are generally reasonable in comparison to the efforts rendered during the process	These procedures are generally expensive,and the cost can increase if bone grafts or sinus lift surgeries are advised.
Implant pieces	Single-piece strength provided by implant is excellent	Two-piece some time the relation between them make the problem
Criteria	There is no criteria required for placement of the basal implants and it can be placed	Adequate bone, good physical health is required for conventional implants placement.
Design	Wide range of designs are available	Limited range of designs are only available
Bone quality	Basal implants are inserted into the basal bone and this bone is supposed to be highly mineralized, greatly dense and has a lower inclination towards bone resorption.	Conventional implants are placed into the crestal alveolar bone whose bone quality is poor and is more inclined towards resorption
Sinus lift	These procedures do not require an additional sinus-lift surgery	If conventional implants have to be placed in the atrophic posterior maxilla, then sinus-lift surgeries maybe indicated.
Implant strength	Basal implants derive their strength from single-piece implants.	Conventional implants are made up of two-piece implants and often-times the relation between them create the problem
Impressions	These procedures are non-complex and employ the use of conventional impressions of the implants that can be made with routine bridgework procedures.	These procedures require different type of impressions (open tray, closed tray etc) and involve generally increased chair time.

In recent years, there have been several advances in basal implantology that have improved the success rates and outcomes of implant placement surgeries. Some of these advances include:

Design improvements: Basal implants have been redesigned to optimize their stability and ensure a high success rate. These implants are typically made from high-quality materials like titanium or zirconia and feature advanced surface treatments to enhance osseointegration.

Computer-guided implant placement: Computer-guided implant placement involves using 3D imaging and virtual planning software to precisely plan and place implants in the optimal location. This approach can improve accuracy, reduce complications, and result in faster healing times.

Flapless surgery: Flapless surgery involves making a small incision in the gum tissue without the need for a full flap, which can reduce the risk of complications and promote faster healing.

Immediate loading: Basal implants are designed to be immediately functional, meaning that a fixed bridge or denture can be placed on the same day as the implant placement surgery. This can improve patient satisfaction and reduce the overall treatment time.

Minimally invasive surgery: Minimally invasive surgery involves using smaller incisions and less invasive techniques to place implants. This approach can reduce discomfort, swelling, and healing time for patients.

Bone graft-free implant placement: Basal implants can often be placed without the need for bone grafting, which can reduce the overall cost and complexity of the implant placement procedure.

II. Summary:

Basal implants are a type of dental implant that has been developed to address the challenges of conventional implants in patients with poor bone quality or quantity. Basal implants have been gaining popularity due to their unique design, surgical technique and high success rate. In this literature review, we will discuss the characteristics, indications, surgical technique, prosthetic options, and clinical outcomes of basal implants.

Characteristics of basal implants:

Basal implants have a wider base and a tapered design compared to conventional implants. They are made of biocompatible materials such as titanium, zirconia or ceramic. Basal implants are designed to achieve immediate stability and anchorage in cortical bone, which allows for immediate loading and osseointegration.

Indications for basal implants:

Basal implants are indicated for patients with poor bone quality or quantity, systemic diseases, atrophy of the jawbone, or those who have failed previous implant treatments. They are also indicated for patients who need immediate restoration and cannot wait for the conventional implant healing period.

Surgical technique for basal implants:

The surgical technique for basal implants is different from conventional implants. It is a one-stage surgical technique that involves placing the implant directly into the basal bone with minimal bone preparation. The implant is placed in a way that it is in contact with the cortical bone, which provides stability and anchorage. The implant can be loaded immediately after placement, which allows for immediate function and osseointegration.

Prosthetic options for basal implants:

Basal implants are designed primarily for full arch restorations. The prosthetic options include fixed prostheses such as bridges, hybrid prostheses, or removable prostheses such as overdentures. The prostheses can be supported by as few as four implants, which reduces the treatment time and cost for patients.

Clinical outcomes of basal implants:

Studies have shown that basal implants have high success rates ranging from 92-98%. The immediate loading and osseointegration of basal implants have been shown to reduce treatment time and cost for patients. Basal implants have also been shown to have a lower incidence of peri-implantitis and bone loss compared to conventional implants. In conclusion, basal implants offer a viable option for patients with poor bone quality or quantity, systemic diseases, or those who have failed previous implant treatments. The unique design, surgical technique, and prosthetic options of basal implants allow for immediate function, osseointegration, and reduced treatment time and cost. While more long-term studies are needed to evaluate the clinical outcomes of basal implants, the early results are promising and suggest that basal implants have the potential to revolutionize implant dentistry.

Future directions:

Basal implants are implanted in a different way as compared to conventional implants, hence the pain associated with it is minor or negligible. The amount of swelling may vary from patient to patient. Since these implants are placed flapless and do not require any bone grafting or additional surgeries, the discomfort associated with it is very negligible. The surgery is done under local anesthesia, that is why during the implantation of implant the patient feels nothing, and as the tissues are not practically traumatized, the rehabilitation period passes quite

easily and without pain. The atrophied maxilla and mandible pose a concern for the placement of conventional implants owing to the need for bone grafting procedures, additional surgery and overall increased costs. With a view towards addressing these drawbacks, the concept of basal implants was introduced. These implants are anchored into the basal bone and hence mechanically engage into the bone. These implants have also reported success in patients with periodontal disease, smokers and in diabetics. They do not required additional procedures like bone grafting thus decreasing associated expenses and making it a very feasible option presently. However, current literature lacks adequate long term studies that reports of the bone changes associated with these implants, hence future studies can be directed towards analyzing and observing the changes around the bone structure and volume surrounding these implants.

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