issn 2193-4673 • Vol. 21 • Issue 2/2025

2/25

© Artur/Solid photos – stock.adobe.com

roots

international magazine of endodontics

review
The endodontic challenge in patients with diabetes

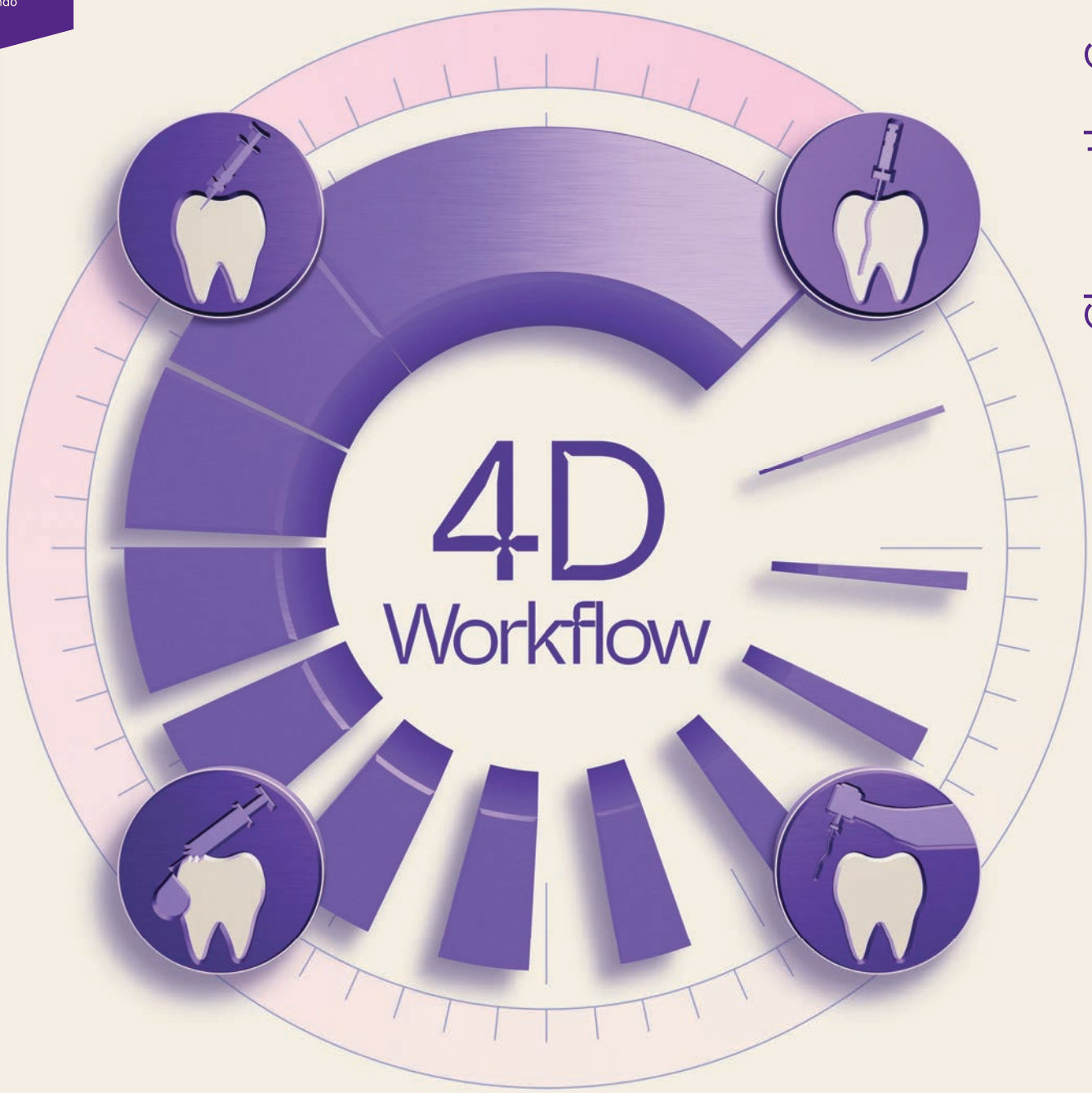
opinion
Optimising oral health outcomes for cancer patients

case report
From the inside out—a seamless journey from endodontic therapy to restoration

dti] Dental Tribune International

FKG
swiss endo

Change the Game



Workflow

Unlock Endo's 4th Dimension

The 4D Workflow brings together the four pillars of modern endodontics—shaping, equipment, irrigation, and obturation—into one streamlined system.
It simplifies every step, shortens procedure time, and delivers consistent, anatomically accurate results with confidence and ease.
That's how we empower endo.

Discover why:
fkg.ch/4d-workflow

4D Workflow

Magda Wojtkiewicz

Managing Editor

A holistic lens on endodontics

In the second—and final—issue of roots for 2025, it feels fitting to take a step back and look at endodontics through a broader, more interconnected lens. Dentistry is shifting towards a holistic approach, one that recognises the mouth not as an isolated system but as a vital part of whole-body health. This issue embraces that perspective fully, reflecting how modern clinicians think, diagnose and treat every day.

This issue opens with an editorial by our colleague Fraser Macdonald, who examines the relationship between dental procedures and postoperative peri-prosthetic joint infection. It is a timely reminder that clinical decisions may have consequences that extend far beyond the tooth.

This theme continues with an in-depth review by Dr Samer N. Hanna, who explores the endodontic challenges presented by patients with diabetes. His clear breakdown of pathophysiology, clinical impact and treatment considerations underscores how systemic health directly shapes the way clinicians plan and deliver endodontic care.

Dr Roumiana Tzvetkova turns our attention to oncology, offering practical guidance for optimising oral health outcomes in cancer patients. Her message is clear: meaningful prevention and management require cooperation that extends across disciplines. Drs Philippe Sleiman and Ibrahim Nasseh then shift the focus to diagnostics, discussing how DTX Studio Clinic can refine the clinician's interpretation of bone lesions—a reminder that good dentistry begins with good diagnosis.

Case reports bring the holistic theme into clinical reality. Dr Gergely Götz presents a case of remarkable recovery from severe inflammation, revealing just how powerful biology can be when given the right support. Dr Byron Tsivos walks us through a seamless journey from endodontic therapy to the final restoration—underlining that root canal treatment is only one part of securing the tooth's long-term prognosis. Dr Sleiman demonstrates the versatility of using one system with different file working motions to tackle daily challenges, and Drs Jenner Argueta, Ana Lucía Orellana and Mónica A. Toledo present a compelling four-year follow-up of a surgical extrusion with 180° rotation.

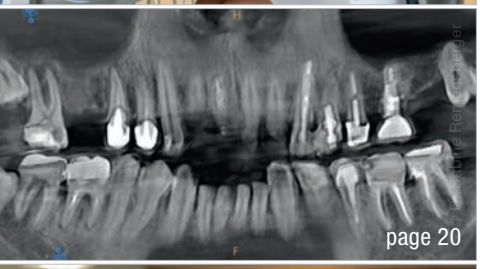
Industry news highlights how innovation continues to support this broader vision of care. Odne introduces a global continuing education platform focused on advanced endodontic therapy, Dentsply Sirona celebrates a decade of WaveOne Gold and Henry Schein's Paolo Zanetti shares in an interview how clinically relevant solutions remain at the core of the company's innovation strategy.

As we close another year, we hope that this issue encourages you to treat not just the tooth but the whole patient—and to keep learning, connecting and growing as practitioners committed to excellence.

Sincerely,

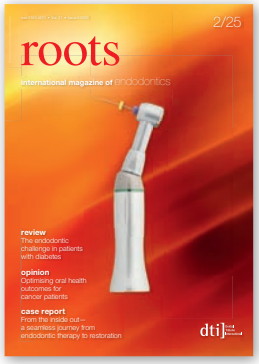
Magda Wojtkiewicz
Managing Editor

page 12


page 20

page 38

Cover image courtesy of
Artur/ Solid photos – stock.adobe.com



editorial

A holistic lens on endodontics 03

news

Dental procedures and their relationship with postoperative peri-prosthetic joint infection 06

review

The endodontic challenge in patients with diabetes: Pathophysiology, clinical impact and treatment considerations 08

opinion

Optimising oral health outcomes for cancer patients: A clinician's guide to prevention and management 12

Diagnostic tips for bone lesions with DTX Studio Clinic 16

case report

Full recovery from a severe inflammation can be miraculous! 20

From the inside out—a seamless journey from endodontic therapy to restoration 24

One system, different motions for daily challenges 28

Surgical extrusion with 180° rotation— A case report with four-year follow-up 32

industry news

Odne Campus builds global CE platform for advanced endodontic debridement 36

Dentsply Sirona: Advancing endodontics through evidence, quality and innovation 38

"Our innovation focus is on delivering meaningful, clinically relevant solutions" 40
An interview with Paolo Zanetti

WaveOne Gold turns ten: Dentsply Sirona celebrates a decade of endodontic innovation 42

manufacturer news 44

meetings

International events 48

about the publisher

submission guidelines 49

international imprint 50

EDM NiTi FILE SYSTEM

HyFlex EDM – OGSF Sequence

Now also in 31 mm!

OGSF Standard Protocoll for Everyday & Complex Cases

- Maximum patient safety
- Easy application
- Fast results

NEW!

COLTENE

6M60 10.25

Dental procedures and their relationship with postoperative peri-prosthetic joint infection

Fraser Macdonald, Dental Tribune International

As the global population ages, the number of total joint arthroplasties (TJAs), particularly of the hip and knee, correspondingly increases. Between 1 and 2% of these surgical procedures result in peri-prosthetic joint infection (PJI).[1] A substantial body of literature has explored the connections between these life-threatening infections and oral health, though reaching scientific and professional consensus has proved intractable. In this article, the most salient threads in the discussion are explored and the current state of knowledge described.

Postoperative peri-prosthetic joint infection

The onset of PJI varies widely, from within four weeks up to two years postoperatively. The gravity of PJI is clear: it is, according to a recent study, a "rare, but devastating complication" with a mortality rate as high as 11%.[2] In addition, it poses significant financial and psychological burden. Speaking on this severe diagnosis, Benjamin Kujat, a specialist in orthopaedics and trauma surgery and an active researcher in this field, told Dental Tribune International that "despite the low prevalence of PJI, the resulting limitations and consequences for patients can be devastating. Treatment often requires multiple surgical interventions and weeks of antibiotic therapy, involves prolonged periods of suffering, and usually leads to a markedly worse functional outcome compared with the preoperative condition." Moreover, the economic burden on the healthcare system is immense. Based on statistical data from 2002 to 2017, the cost of treating peri-prosthetic infections in the US by 2030 has been estimated at US$1.85 billion (€1.53 billion*).[3] Given that each case can cost up to US$100,000 to manage, the financial burden is disproportionately high. Therefore, for both patients and the healthcare system, each case is one too many.

While the majority of these infections originate in the peri-prosthetic tissue, secondary infections may arise from the oral cavity through the bloodstream. In this context, recent research has shown that "oral foci are not primarily causative for EP [endo-prosthesis] infection, but represent an important reservoir for EP colonisation".[4] This potential source of infection is of particular concern for dentists. In this respect, Kujat stated that "existing research has shown that there is a significantly higher incidence of joint infections caused by oral bacteria than from other sources. This finding indicates that joint prostheses are at risk of haematogenous infections originating from the oral cavity. Dental procedures are highly relevant because of both their frequency and the lack of awareness of the connection between bacteraemia after dental procedures like extraction and joint infections around artificial surfaces without immune response capabilities. So, in my opinion, dental procedures have a significantly higher risk because they occur very often". So, where does dentistry fit into the treatment of this complex scenario?

The role of dentistry

Dental procedures are believed to potentially introduce oral bacteria into the bloodstream, creating a risk of colonisation on prosthetic joint surfaces and the subsequent development of PJI. Speaking in a press release accompanying the publication of the American Academy of Orthopaedic Surgeons (AAOS) practical clinical guidelines for the prevention of total hip and knee arthroplasty PJI in patients undergoing dental procedures, board-certified orthopaedic surgeon Dr Yale Fillingham stated that "PJI is one of the most devastating complications for patients following TJA, and we must do everything possible that is supported by evidence to prevent these infections. Given the large number of annual TJA procedures and that most of these patients undergo a dental cleaning at least twice a year, [these guidelines are] relevant to nearly every TJA patient."[5] The overarching goal in this respect is for dentists to utilise all means at their disposal in order to prevent the migration of bacteria from the oral cavity to the prosthetic site as a direct result of dental procedures conducted prior to or after the joint replacement surgery. While a variety of measures have been proposed, their efficacy in reducing the risk of PJI, as well as the causal link between dental procedures and PJI more generally, is far from definitive.

A common practice is the use of antibiotic prophylaxis in TJA patients before invasive dental procedures, driven partly by the expectations of both orthopaedic surgeons and their patients. Indeed, as shown in the AAOS guidelines, the annual cost of dental antibiotic prophylaxis in the US alone for patients undergoing TJA is US$59 million.[6]

Benjamin Kujat, a specialist in orthopaedics and trauma surgery and an active researcher in this field. *(Image: © Benjamin Kujat)*

The question is whether the prophylactic use of antibiotics in this context has any evidence to support it. The literature almost unanimously reports that there is very little connection between invasive dental procedures and the occurrence of PJI and that therefore the prophylactic use of antibiotics in TJA patients is not well supported.

A Taiwanese study found that the "risk of PJI is not increased following dental procedures in patients with hip or knee replacement and is unaffected by antibiotic prophylaxis."[7] An American study found there to be "no significant positive association between [invasive dental procedures] and subsequent development of [late PJIs] and no significant effect of [antibiotic prophylaxis] in reducing [late PJIs]",[8] and another American study similarly found that "antibiotic prophylaxis prior to dental procedures did not decrease the risk of subsequent total hip or knee infection".[9] While the scientific verdict is clear, the practice is however likely to continue owing to dentists' belief in its efficacy, combined with the expectations of orthopaedic surgeons and their patients alike.

Despite the lack of empirical evidence linking the spread of oral bacteria to infection at the prosthetic site, dental screenings are commonly performed prior to TJA to identify potential sources of bacteria that might pose a postoperative risk. As with antibiotic prophylaxis, this strategy has been subject to careful study. An American study that compared over 8,000 patients who underwent a dental screening prior to TJA against a cohort that did not reported that it "did not find that dental clearance decreases the rate of infection and also did not show a difference in organism profile between infections after dental clearance versus no dental clearance".[10] Similarly, an important German study found "no general association between early infection rate and preoperative oral screening".[11] So, is dental screening of no significance to this type of infection? A vital part of the German study was the comparison of PJI frequency between patients screened by a dentist and those screened by an orthopaedic surgeon. The result of this investigation was that "100% of observed infections in the screening group occurred in the group with previous oral screening by an orthopaedic surgeon". Kujat explained the technical origins of this finding: "While obvious dental issues can be examined easily by an orthopaedist, some hidden potential sources of infection can only be diagnosed by a dentist with his or her more specialised tools and experience, such as periodontitis, apical lesions or root inflammation." So, while preoperative dental screening in general may not be associated with the occurrence of infection screening by a dentist appears to significantly affect detection of infection risk.

Another American study explored the relationship between oral health and postoperative PJI not in terms of antibiotics or screening but the absence or presence of natural dentition.[12] The research, which reviewed 1,157 medical charts, found that dentate patients had a nearly threefold higher rate of PJI compared with edentulous patients. The study highlights the need for further investigation into whether dentition status should inform postoperative monitoring protocols or preoperative dental assessment in TJA patients.

A final strategy available to mitigate the risks of bacterial transfer from the oral cavity to the prosthetic site is to delay the joint replacement surgery, thereby eliminating the potential for infection to occur as a result of transient bacteraemia, invasive dental procedures or the treatment of a dental infection. This is an option suggested in the updated AAOS clinical guidelines. In this light, should dentists support the delay of hip and knee replacement surgeries owing to a risk of exposing their patients to bacterial transmission? The AAOS guidelines suggest that non-invasive dental procedures such as scaling may cause brief bacteraemia that resolves within a day, allowing them to be safely performed until the day before elective TJA. In contrast, oral surgical procedures such as extractions require healing of a few days to two weeks. In patients with slower healing, such as those with diabetes, this may extend to three weeks. Since bacteraemia risk decreases once epithelialisation is complete, a three-week waiting period is recommended before proceeding with TJA after oral surgery. Active dental infections require antibiotics and often extraction or root canal treatment, and surgery should be postponed until the infection is fully resolved.

Concluding remarks

Postoperative PJI is a rare but serious complication of TJA, carrying significant medical, financial and psychological burden. While oral bacteria have long been suspected as a source, current evidence shows little causal connection between dental procedures and PJI. Antibiotic prophylaxis and preoperative dental screening, though widely practised, appear to provide minimal benefit, and their routine use rests on weak scientific foundations. Timing remains important: routine dental care is safe immediately before surgery, but oral surgery should precede TJA by three weeks, and active infections must be fully resolved. The debate continues, but caution and individualised care remain central.

** Calculated on the OANDA platform for 9 December 2020.*

Editorial note: Please scan this QR code for the list of references.

© JackF/Shutterstock.com

The endodontic challenge in patients with diabetes: Pathophysiology, clinical impact and treatment considerations

Dr Samer N. Hanna, UK

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder that has emerged as a major global health concern. It is broadly classified into two main types. Type 1 DM, typically manifesting at a young age, is an autoimmune condition characterised by insufficient insulin production resulting from immune-mediated destruction of pancreatic beta cells. In contrast, Type 2 DM, which generally develops during adolescence or adulthood, is defined by reduced sensitivity of peripheral tissue to insulin, leading to insulin resistance and impaired glucose metabolism.[1]

The global prevalence of DM continues to rise at an alarming rate. As of 2022, it is estimated that more than 800 million adults worldwide have DM—more than quadruple the number recorded three decades ago.[2] Around 7% of adults were affected in 1990, whereas by 2022, the prevalence had reached approximately 14%.[2] This escalating trend poses serious public health challenges, and an estimated 1.6 million deaths in 2021 were directly attributed to DM and its complications.[2]

DM is associated with a wide range of systemic complications; however, its impact on oral health is particularly significant. Individuals with DM are known to exhibit a higher prevalence of periodontal disease, an increased susceptibility to dental caries, persistent halitosis and xerostomia. Moreover, they are more prone to oral fungal infections and frequently experience delayed wound healing, which can complicate both routine and surgical dental procedures.[3]

Effects of DM on pulpal and periapical tissue

Hyperglycaemia in DM induces widespread microvascular damage and impaired blood flow, affecting not only systemic tissue but also the dental pulp and periapical region. Histopathological studies have shown basement membrane thickening, reduced vascular density and perivascular collagen deposition within pulpal tissue of patients with DM—factors that collectively restrict oxygen and nutrient supply essential for normal repair processes. Moreover, chronic hyperglycaemia promotes the formation of advanced glycation end-products, which exacerbate oxidative stress, enhance fibrotic changes, and further impair immune response and tissue healing in the pulpal and periapical tissue.[4,5]

Immunological dysfunction in DM further compromises the host's ability to combat infection and inflammation. Reduced neutrophil activity, altered cytokine expression and a state of chronic low-grade systemic inflammation collectively impair the resolution of infectious processes. As a result, dental pulp in patients with DM is more susceptible to persistent inflammation, chronic pulpitis and delayed healing after injury or microbial insult.[5]

In a study investigating the effects of Type 2 DM on clinically normal pulpal tissue, the authors observed morphological alterations resembling those seen in age-related pulpal changes.[4] These included fibrosis, reduced vascularity and pulpal calcifications, accompanied by enhanced pro-inflammatory activity. Such pathological changes may impair the pulp's defence mechanisms, diminish its response to irritants and infections, and compromise its healing capacity after injury or restorative procedures.[4]

Endodontic implications

Clinical evidence strongly suggests that DM—particularly when poorly controlled (i.e. haemoglobin A_{1c} [HbA_{1c}] ≥7%)—is associated with an increased prevalence of periapical periodontitis, impaired periapical healing and lower success rates after root canal treatment. In a prospective cohort study, patients were categorised into three groups: no DM, well-controlled DM (HbA_{1c} <7%) and poorly controlled DM (HbA_{1c} ≥ 7%).[6] After a one-year follow-up, the authors concluded that DM significantly delays the healing of periapical periodontitis and that the presence of periapical periodontitis itself may further exacerbate systemic inflammation in individuals with Type 2 DM. Interestingly, the study also highlighted a potential bidirectional relationship between endodontic therapy and glycaemic control, suggesting that successful root canal treatment contributes to improved metabolic regulation in patients with DM.[6] Similarly, another study evaluating

© Road Red Runner – stock.adobe.com

the healing of periapical periodontitis in patients with DM reported that DM may negatively influence periapical tissue repair and delay healing after non-surgical root canal treatment.[7] The study further found that patients with DM were approximately five times more likely to experience persistent periapical periodontitis after root canal treatment compared with those who did not have DM.

Chronic hyperglycaemia has also been shown to alter the nanostructure and mineral composition of root canal dentine, resulting in reduced mechanical integrity and greater susceptibility to structural damage during endodontic instrumentation and obturation.[8] These pathological alterations highlight the importance of meticulous treatment planning and technique adaptation when managing endodontic care in patients with DM.[8]

Clinical considerations and treatment modifications: Step-by-step guide

Diagnosis

Prior to treatment, it is essential to confirm the patient's DM status using recent HbA_{1c} results, as values above 7% indicate poor glycaemic control and are associated with delayed or impaired healing. Collaboration with the patient's physician or endocrinologist is recommended to evaluate systemic stability and determine the safety of proceeding with endodontic therapy. Clinicians should also recognise that patients with DM may exhibit atypical

> "DM is associated with a wide range of systemic complications; however, its impact on oral health is particularly significant."

or diminished clinical symptoms due to neuropathic alterations and chronic low-grade inflammation, making comprehensive pulpal testing and advanced radiographic assessment—including CBCT imaging—critical for accurate diagnosis and periapical evaluation.[5,9] Moreover, pulp testing may yield unreliable results in patients with DM, as responses are often delayed or blunted, particularly in cases of poor glycaemic control.[10]

Anaesthesia

Local anaesthetics containing vaso-constrictors should be used with caution in patients with DM, especially those with hypertension or coronary artery disease, owing to potential cardiovascular risks. Preoperative blood glucose measurement is recommended, and treatment should be postponed if the patient presents with hypoglycaemia or hyperglycaemia in order to minimise the risk of adverse events. Clinicians should also