Received: 5 July 2023 | Accepted: 1 March 2024

DOI: 10.1111/jopr.13841

ORIGINAL ARTICLE

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Single lateral implant for mandibular overdentures as a fallback solution or a viable treatment alternative: Four case reports

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Abstract

This report of four clinical cases aims to illustrate the use of a lateral implant as a solution for implant overdentures in the mandible in different clinical situations. The first two cases describe the clinical situations of patients wearing two-implant mandibular overdentures until the failure of one of the implants, one due to implant loss and the other due to a fracture of an abutment screw, and how the conditions were managed. The third case illustrates the placement of a single implant to retain an overdenture, where a midline implant, as originally planned, was not feasible due to anatomic reasons. The final case describes the use of a lateral implant to support and retain a single-implant mandibular overdenture. The four cases demonstrate that a single lateral implant can be utilized as sole retention in cases of a failing contra-lateral implant and as an alternative to a single implant in the midline.

KEYWORDS
case report, dental implants, dental prosthesis, denture, implant-supported, prosthodontics, single-implant overdenture

An implant-supported overdenture (IOD) retained by two implants is a highly successful treatment option for the edentulous mandible.[1–3] Various studies and systematic reviews have demonstrated implant survival rates of 93%–100% at medium- and long-term follow-ups, even in very old and frail patients, irrespective of the attachment system used.[4–8]

The failure of one implant in a two-implant overdenture (2-IOD) can be a major complication when the replacement of the lost implant in a 2-IOD scenario is not possible. Therefore, maintaining the remaining single implant as the sole retention for an overdenture is a treatment option to consider.

The use of a single implant placed in the midline to retain a mandibular overdenture (1-IOD) has been proposed as an alternative to the standard 2-IOD, with the advantage of being less invasive and more cost-effective.[9] Moreover, this treatment option seems to present high survival and success rates, adequate satisfaction of patients, and oral health-related quality of life, as evidenced in various randomized clinical trials and systematic reviews.[10–17] However, the choice of the position in the midline is not based on evidence demonstrating its superiority compared to an alternative position, which could present similar or improved results.

There is minimal reported evidence concerning the use of a 1-IOD with an implant in a lateral position instead of the proposed midline positioning, be it as a fallback treatment option in cases of a failing contra-lateral implant or due to an impossibility of placing a single implant in the midline.[10] However, empirical clinical experience has demonstrated overall clinical success and patient satisfaction with this option in various cases. This has subsequently led to considering a lateral

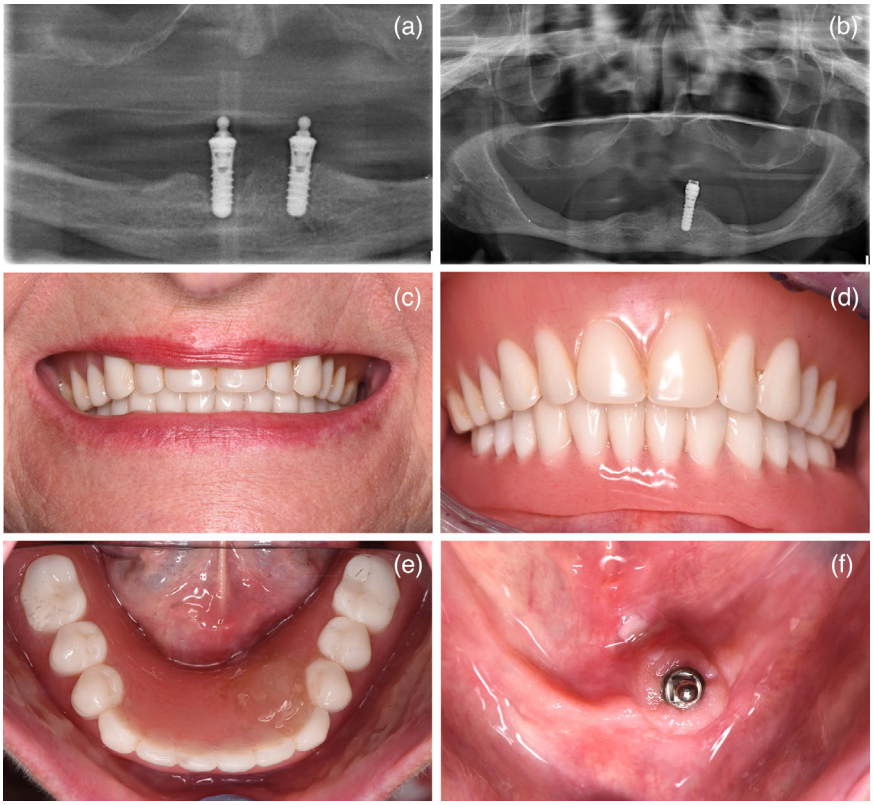

FIGURE 1 (a) Former recuperated orthopantomographic radiograph (OPG) with failing implant 43 and previous spherical patrices; (b) OPG with remaining implant in situ and existing Locator patrix; (c) Frontal view of final aesthetic result; (d) Frontal view of existing maxillary complete denture in occlusion with new mandibular implant overdenture (IOD); (e) Occlusal view of new mandibular IOD in situ; (f) Occlusal view of new spherical patrix on implant 33.

implant positioning as a possible treatment concept in cases of 1-IODs. Therefore, this report of four clinical cases aims to illustrate the use of a lateral implant as a solution for IODs in the mandible in different clinical situations.

CLINICAL REPORTS

Two patients were treated over the course of routine clinical management, and two others were treated within the context of clinical research studies. The studies determined the choice of implant positioning in these cases but did not influence their general management. No information is reported that could identify the patients, and the summary of individual case reports is exempt from formal ethical approval. All patients were informed about the publication of the case reports and provided informed consent. This report was prepared according to CARE guidelines (https://www.care-statement.org/).

Case report 1

A 72-year-old female patient with no history of medical issues attended the Restorative Department of the Centre for Dentistry at Queen's University of Belfast, United Kingdom, complaining of difficulty tolerating her existing mandibular prosthesis. Two regular platform tissue level Straumann implants had been placed 15 years previously to support a complete mandibular 2-implant overdenture (Figure 1a). The implant in the mandibular right quadrant had later been lost, resulting in poor retention of the prosthesis. The remaining implant in the mandibular left quadrant was secure (Figure 1b). A cone beam computed tomography (CBCT) scan showed inadequate bone availability within the mandible to facilitate further implant placement on the right side. The patient's existing mandibular complete prosthesis was underextended posteriorly. The prosthesis engaged with a LOCATOR® attachment (LOCATOR®; Zest Dental Solutions, California, USA) on the single remaining implant, however, retention was lost upon functional movements which embarrassed the patient.

The maxillary complete denture was not replaced, as it was judged functionally and esthetically acceptable by the patient and clinician. A new complete mandibular overdenture was fabricated following a conventional workflow and adhering to conventional prosthodontic principles (conventional preliminary impression, border-molded impression with a custom tray, occlusal registration with wax bite rim, try-in of mounted denture teeth with a balanced occlusion and subsequent manufacturing of the denture in the laboratory with heat-polymerized resin). A ball attachment (Retentive Anchor; Institut Straumann AG, Basel, Switzerland) was placed on the single remaining implant with the retentive element attached directly in the mouth using auto-polymerizing acrylic resin (Quick Up; Voco GmbH, Cuxhaven, Germany) at denture delivery (Figure 1c–f). The patient was satisfied with the esthetics and retention of the prosthesis, including at the subsequent recalls at 6 months, 1, and 2 years. No complications were reported during the follow-up period.

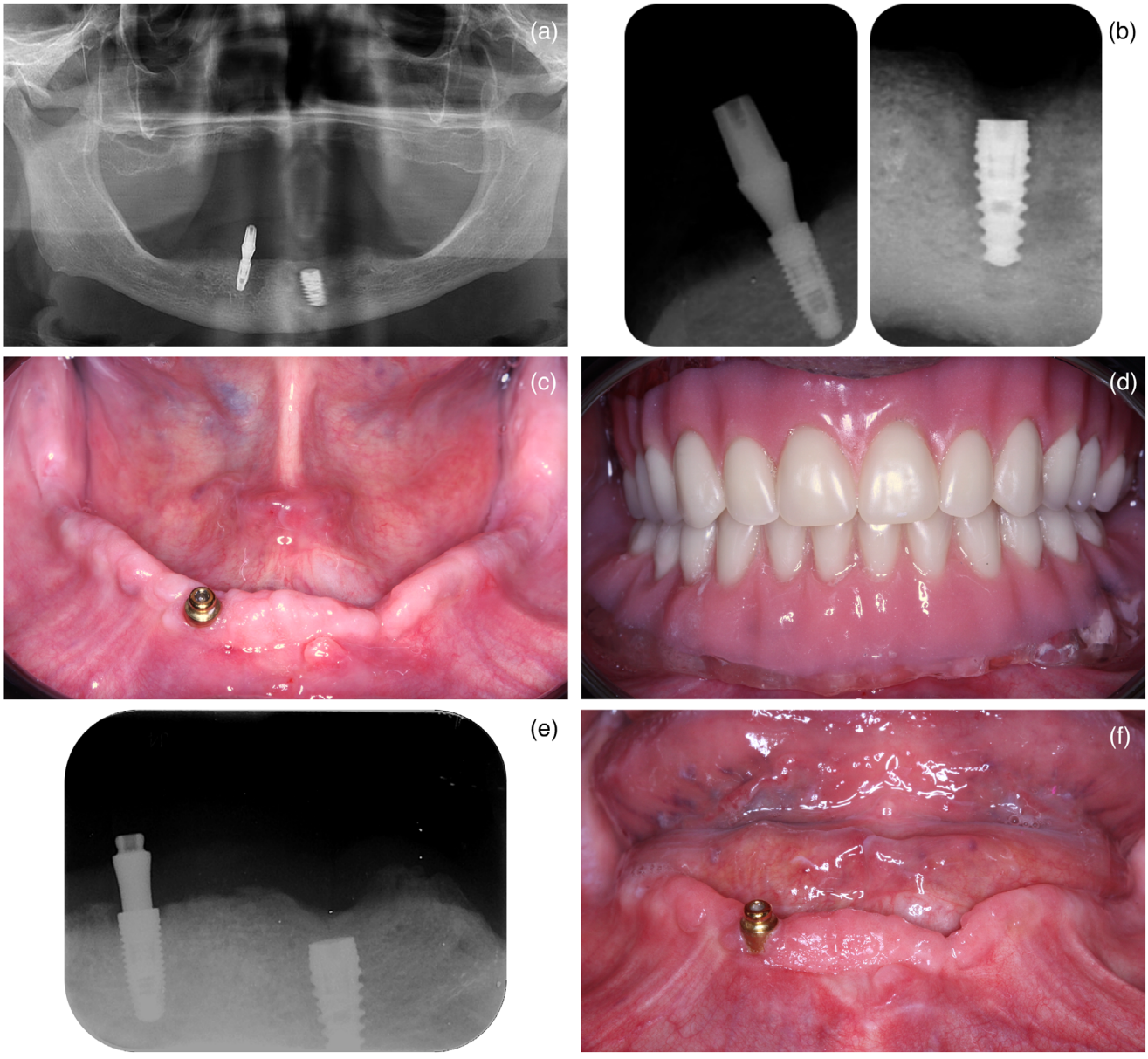

FIGURE 2 (a) OPG at initial examination; (b) Intraoral radiographs of implants 33 and 43; (c) Frontal view of Equator patrix on implant 43; (d) Frontal view of processed dentures in situ; (e) Intraoral radiograph of implants 33 and 43 at 2-year follow-up; (f) Frontal view of Equator patrix on implant 43 at 2-year follow-up.

Case report 2

A 64-year-old female patient was referred to the School of Dentistry of the Federal University of Goias, Brazil, due to a failed mandibular overdenture treatment on two implants. The patient reported that the implants had been placed 6 months previously, and the left implant had a fractured screw that could not be retrieved. The maxillary and mandibular complete dentures were in poor condition and needed replacement.

There was no relevant medical or dental history to report. The radiographic examination (Figure 2a, b) showed two inter-foraminal morse-tapered implants. The implant on the left side was covered by mucosa and presented with a fractured screw. The patient was not willing to undergo any further surgical treatments and opted for new dentures following a conventional workflow as described in the previous case, and the use of the right-side implant to retain a single-implant overdenture while keeping the left implant submerged.

A 4.5-mm stud attachment (Equator Attachment; Neodent SA, Curitiba, Brazil) was selected to adapt to the remaining implant and the female metal housing with a nylon matrix was incorporated into the mandibular denture using the same technique as Case 1 (Figure 2c and d). The patient reported high satisfaction with the dentures in the immediate post-delivery period. The only maintenance event occurred after 10 months to replace the nylon matrix. The patient returned

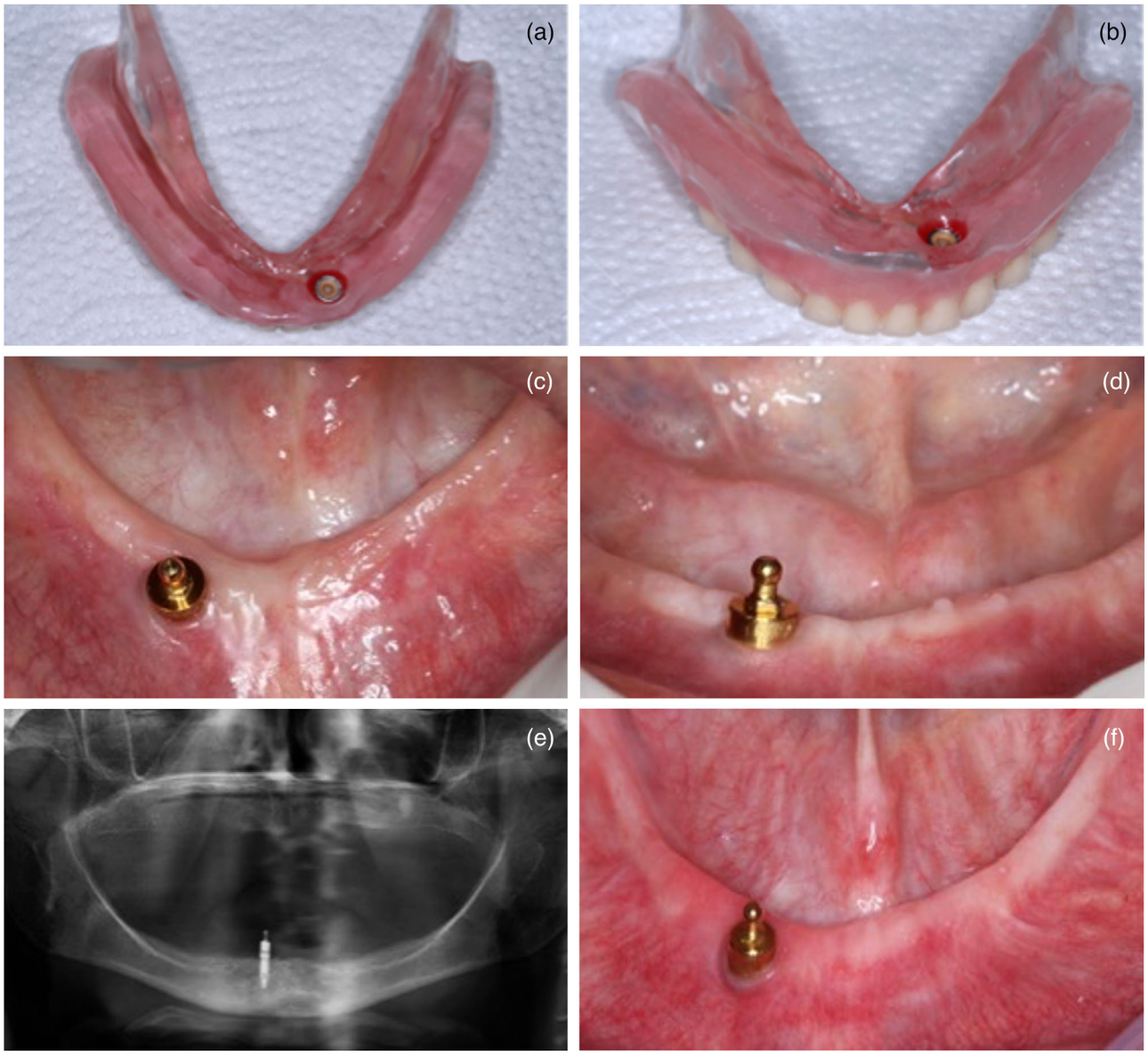

FIGURE 3 (a) Post-processing of attachment housing in denture; (b) Attachment housing positioning between teeth 42 and 43; (c) and (d) Occlusal and frontal view of spherical patrix on implant 43 at 1-year follow-up; (e) OPG after 6 years with normal peri-implant bone levels; (f) Frontal view of spherical patrix on implant 43 at 6-year follow-up with minimal mucosal recession on the buccal aspect.

for a 2-year follow-up during which she reported normal use of the overdenture and no relevant complaints (Figure 2e and f).

Case report 3

A 69-year-old female patient reported to the School of Dentistry of the Federal University of Goias, Brazil, with the chief complaint of difficulty in chewing with old complete dentures with 25 years of use. No other dental or medical issues were reported. Clinical and radiographic examinations revealed adequate bone levels for a subsequent mandibular overdenture. A new set of conventional dentures fabricated following a conventional workflow as previously described was provided. After one year of wear, a single implant overdenture in the mandible midline was planned to improve the stability of the mandibular prosthesis. This treatment was carried out within the context of a clinical trial on immediately-loaded midline single-implant mandibular overdentures.[18] During the implant insertion, a fenestration of the lingual cortical wall occurred. Consequently, another implant site in a lateral right position was prepared. A 3.75 × 9 mm external hexagon implant (Titamax TI Cortical; Neodent SA, Curitiba, Brazil) was inserted with satisfactory primary stability. The implant was immediately loaded with a 4.1 × 3 mm O-Ring/ball attachment (Neodent SA, Curitiba, Brazil) and connected to the overdenture using an intraoral pickup technique as described previously. The ball attachment was positioned in the region between teeth 42 and 43 (Figure 3a and 3b).

The patient returned for programmed recall visits after 6 months, 1, 3, and 5 years (Figure 3c and 3d). After four years of wear, the dentures were replaced due to wear of the prosthetic teeth. During the follow-up, a fracture of the denture occurred in the midline, as well as minor complications, such as adjustment due to mucosal sore spots, attachment loosening, and fracture of a maxillary denture tooth. The patient reported continuous use of the overdenture, overall high satisfaction, normal oral functioning, and no request for further implant treatment during the follow-up period. A programmed recall visit 6 years after loading was scheduled and no adverse events were reported. Figure 3e,f shows the clinical and radiographic aspects of the treatment at the 6-year follow-up, at the patient's age of 75 years. No signs of abnormal peri-implant bone and soft tissue changes were observed, and the dentures showed satisfactory fitting and aesthetics.

Case report 4

A 74-year-old male patient reported to the University Clinics of Dental Medicine of the University of Geneva, Switzerland for the rehabilitation of his failing dentition. He had not received any dental care for several years due to severe depression and financial limitations. The patient was rehabilitated with immediate complete maxillary and mandibular removable dentures, which were relined after four months. At the 1-year recall, the patient complained of having difficulty chewing adequately with his mandibular denture, on which he used denture adhesive paste to achieve sufficient retention. The existing prostheses were esthetically-pleasing and functionally adequate, except for the insufficient retention and stability of the mandibular denture. Given the patient's dissatisfaction with the existing treatment, the treatment planned was to convert his conventional mandibular complete denture into an IOD.

In the context of an ongoing clinical trial, the mandibular denture was planned to be retained by a single implant placed in the canine area of the patient's preferred chewing side. This was determined using a chewing test to measure the Asymmetry Index via a video camera recording of the patient during mastication, as described by Mizumori et al.[19] The mandibular denture was marked with gutta-percha in the canine regions for spatial referencing in the radiological analysis, performed with an orthopantomographic radiograph (OPG). The patient received a 4.1 × 8 mm implant (Straumann Standard Tissue Level Implant; Institut Straumann AG, Basel, Switzerland). The implant was loaded after 8 weeks with a spherical Retentive Anchor of 6.4 mm height (Institut Straumann AG, Basel, Switzerland). A Dalbo PLUS (Cendres+Métaux SA, Biel, Switzerland) housing was incorporated in the prosthesis in the laboratory after taking a reline impression with a polyether material and the converted denture was inserted the same day (Figure 4a,b).

The patient returned for scheduled follow-up visits at 2 weeks, 3 months, and 1 year, as required by the clinical trial in which the patient participated. A matrix fracture was detected at the one-year follow-up which was immediately replaced (Figure 4c). No other biological or technical complications took place (Figure 4d–f). The patient reported high satisfaction with the prostheses and declared having improved comfort and chewing ability, which allowed for diversification in his choice of foodstuffs.

DISCUSSION

This clinical report describes the successful use of a single implant in a lateral position for the stabilization of an IOD through a variety of clinical situations. The four cases demonstrate that a single lateral implant may be utilized as a fallback solution in cases of a failing contra-lateral implant and as an alternative to the midline position.

The treatment alternatives presented in this report may be considered as another viable treatment concept for the rehabilitation of the edentulous mandible. While the first three cases may be considered as minimal intervention alternatives to minimize patient burdens and additional cost, the choice of using a single lateral implant for retaining an IOD as a primary treatment option must be regarded with caution due to insufficient evidence on its clinical reliability. However, potential benefits of a lateral position compared to the midline may be an increase in masticatory function due to increased support closer to the masticatory center, and a decrease in denture fracture rates due to increased prosthetic volume in the area.

Over the last decades, a variety of implant-based solutions for mandibular overdentures focused on simplifying the interventions needed to reduce treatment morbidity and cost, increasing patient acceptance. This includes the use of narrow-diameter implants, minimally-invasive surgical procedures, protocols with shorter delays before loading, as well as the use of a reduced number of implants.[20–25] The use of a single-implant overdenture, independent of the implant position, as illustrated in the four cases, is in line with a minimally-invasive overdenture treatment concept. The minor prosthetic complications in the form of denture fracture and activation/replacement of female retentive parts, as well as the overall success of the cases presented are consistent with those of previous clinical research.[10,12,13,16,18,25–28]

There is limited evidence available on the success rates of implant retained overdentures in very old and institutionalized patients, and one can assume that in time there will be an increasing need for dental care professionals to manage the results of failing cases.[6,8,29] Managing the oral health needs of an aging population, combined with the maintenance of more complex restorative treatments is an ongoing challenge to dental care professionals. 1-IODs may therefore be more cost-effective, minimally invasive, and simple treatment alternatives that can be used to rehabilitate older edentulous patients while minimizing treatment burden.[9,30] However, the specific use of a lateral implant to retain a 1-IOD has not been sufficiently studied and requires further research.

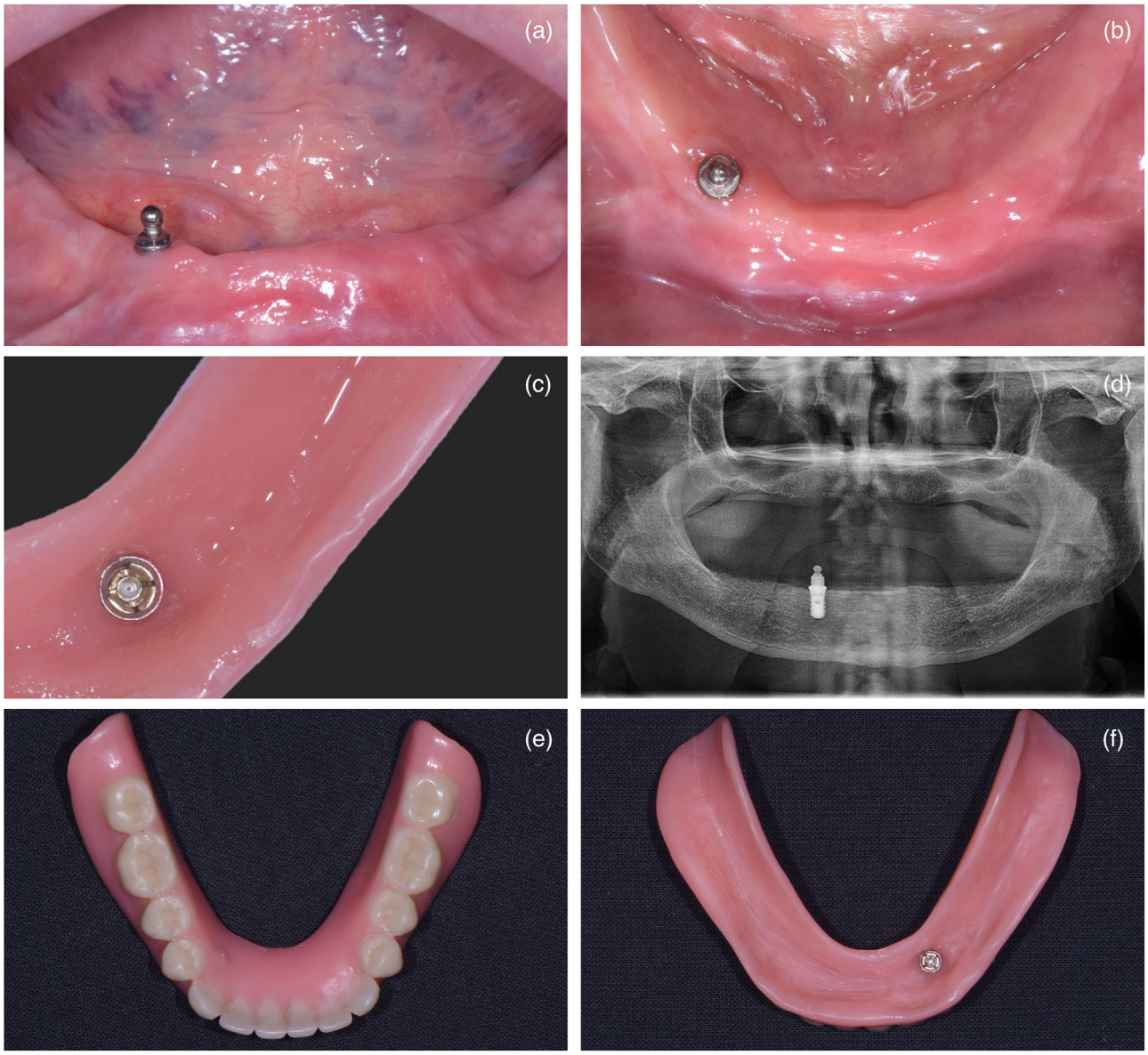

FIGURE 4 (a) and (b) Frontal and occlusal view of spherical patrix on implant 43 at 1-year follow-up; (c) Close-up of the fractured matrix; (d) OPG after 1 year with normal peri-implant bone levels; (e) and (f) Cameo surface and denture base after renewal of the matrix.

CONCLUSION

These four case studies illustrate real-world scenarios describing short and long-term effectiveness and improvement in patient conditions using a lateral single-implant mandibular overdenture. All reported cases suggest that this clinical solution is well-tolerated with no safety concerns.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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How to cite this article: Maniewicz S, Curado TFF, McKenna G, Leles CR, Müller F. Single lateral implant for mandibular overdentures as a fallback solution or a viable treatment alternative: Four case reports. J Prosthodont. 2024;1–7. https://doi.org/10.1111/jopr.13841