

Balancing Biomechanics and Biology:

A Prosthodontic-Periodontal Conundrum in Strategic Tooth Loss Planning

How can removable prosthodontic intervention be ethically and effectively staged to maintain function, hygiene, and adaptability in a patient with advanced periodontal disease and inevitable future tooth loss?

Introduction:

Successful prosthodontic treatment is fundamentally dependent on biological stability [1]. This case describes the longitudinal management of a patient with generalised Stage IV Grade C periodontitis, xerostomia and heavy smoking, where prosthodontic decision-making was repeatedly dictated by periodontal prognosis rather than technical ambition [2]. Although the definitive prostheses were not technically complex, this case exemplifies risk-led removable prosthodontics, requiring periodontal disease progression awareness, patient compliance and adaptable denture design to achieve a functional, maintainable outcome [3].

Pre-operative photographs were obtained following the initial examination and stabilisation phase, at the commencement of definitive treatment planning.

Pre-operative:



Patient Overview:

Demographics and RFA: A 48-year-old dentate female patient attended for examination.

C/O: The patient's primary concerns related to widespread dental sensitivity, progressive tooth mobility, episodes of exfoliation, resulting in functional discomfort during mastication and modified oral hygiene practices.

Medical History:

The medical history included amitriptyline, long-term analgesic use for chronic pain (including codeine, co-codamol and paracetamol), oxybutynin use, eczema, arthritis affecting the left knee/several fingers and a documented penicillin allergy [4].

Dental History & Diet:

Despite low dental anxiety, the patient's engagement with care was initially inconsistent, reflected in irregular dental attendance. Oral hygiene practices included twice-daily toothbrushing with an electric toothbrush—modified by the patient due to concerns regarding mobile teeth—and daily interdental cleaning. A historically high sugar diet (frequent snacking and sugary drink consumption) was also reported.

Social History & Risk Modifiers:

Socially, the patient acted as a full-time carer for a family member, which had a notable impact on engagement with and prioritisation of dental care. The patient presented with multiple high-risk modifiers known to adversely affect periodontal stability and prosthodontic prognosis, including heavy smoking (≥ 20 cigarettes per day), medication-induced xerostomia, and longstanding periodontal neglect, despite abstaining from alcohol consumption [5]. While oral hygiene engagement improved during treatment, the overall prognosis remained guarded due to persistent systemic and behavioural risk factors.

Over time, sustained behavioural modification and improved attendance allowed progression from disease control to definitive prosthodontic planning.

From the outset, this was recognised as a high-risk prosthodontic case, in which long-term success would depend less on technical execution and more on strategic planning, biological realism, and ongoing risk management.

Clinical Findings:

The clinical findings from the initial assessment correlated with the diagnostic radiographs rather than the pre-operative images, as the latter were taken at the commencement of definitive prosthetic treatment.

Extra-oral examination: No abnormalities detected.

Intra-oral soft tissues: Within normal limits.

Salivary assessment: Reduced salivary flow consistent with xerostomia.

Periodontal status: Generalised periodontal disease was present, with multiple teeth exhibiting symptomatic advanced mobility, demonstrating Miller mobility ranging from Grade 1 to Grade 3; mobility was most pronounced in UR1 and LL6, both exhibiting Miller Grade 3 mobility [1, 2].

Oral hygiene: Generalised plaque and calculus accumulation was evident. The gingivae appeared pale pink, oedematous, and exhibited rolled margins.

Occlusion: Bilateral canine guidance was observed in conjunction with a Class I incisal relationship and sufficient overjet and overbite.

Tooth wear: No pathological tooth wear observed.

Kennedy classification: As per radiographs: Maxillary – Class II. As per pre-operative images: Maxillary – Class I Mod I, Mandibular – Class II.

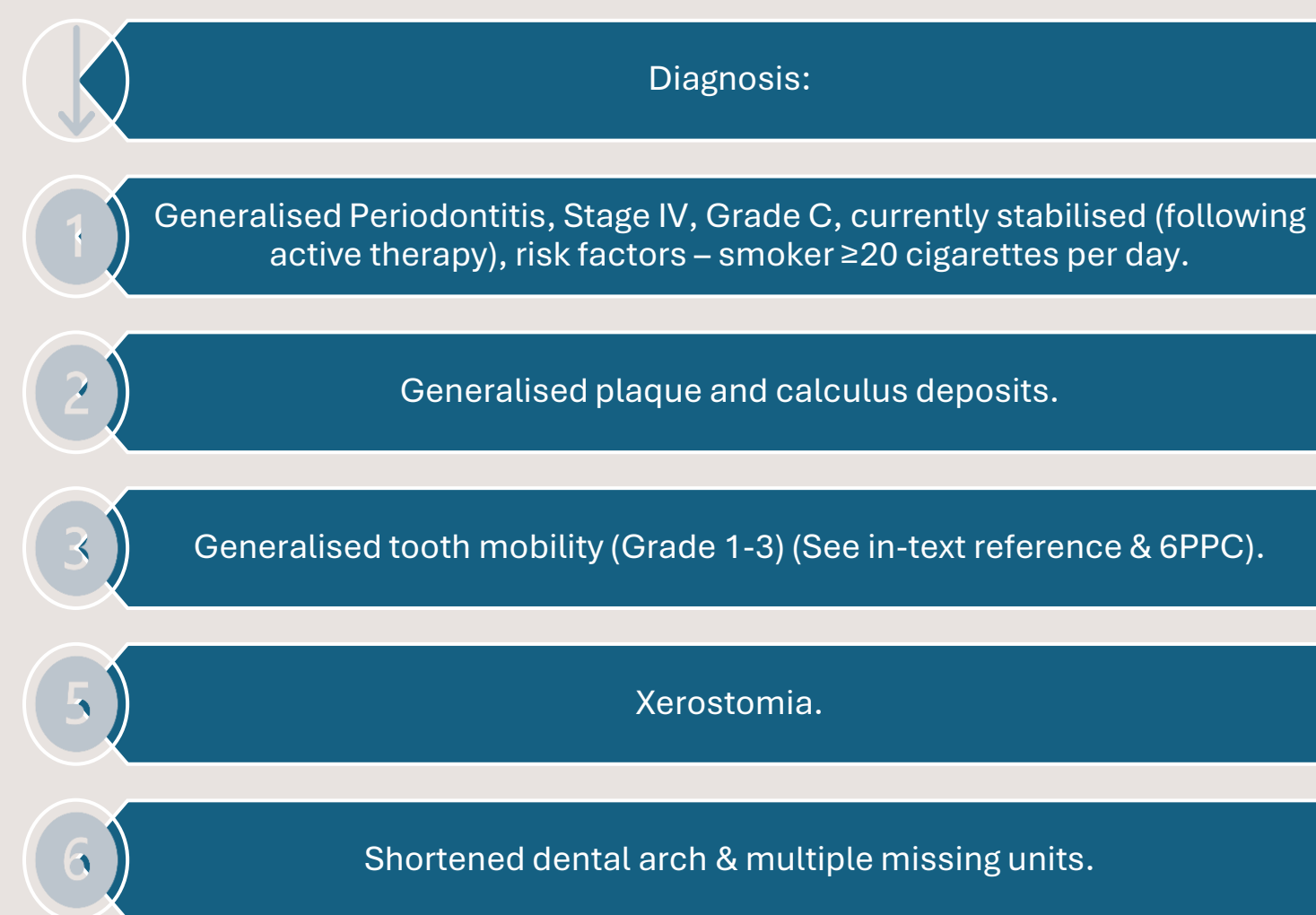
Diagnosis:

Comprehensive clinical examination and radiographic assessment confirmed generalised Stage IV, Grade C periodontitis, with widespread horizontal bone loss exceeding 50–60%.

The prognosis of remaining teeth was guarded to poor, with future tooth loss considered likely despite active periodontal therapy. The principal challenge was not simply the replacement of missing teeth, but the preservation of function with limited periodontal reserve in the context of progressive biological instability [6].

In simpler terms, determining:

- Which teeth could reasonably be retained,
- for how long,
- and how to design prostheses that would remain functional as the dentition deteriorated.



Risk Factors:

Periodontal Risk - High

- Smoker.

Caries Risk – Initially High

- Initially high, subsequently reduced to low following intervention. High sugar intake.

Oral Cancer Risk – High.

- Associated with smoking.

The Prosthodontic-Periodontal Conundrum:

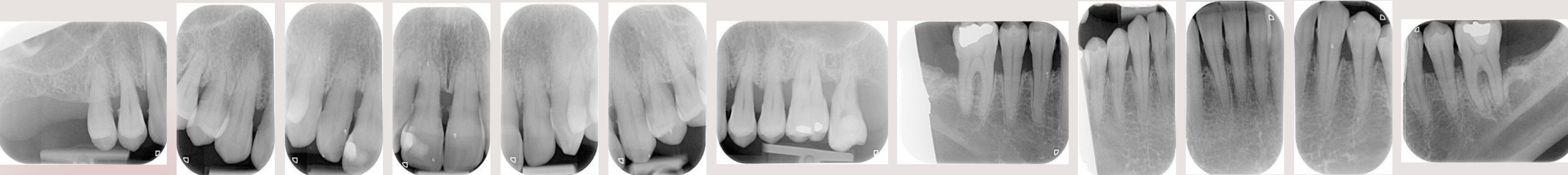
This case represented a classic prosthodontic-periodontal conflict, where the competing priorities of maintaining function and aesthetics conflicted with the biological limitations imposed by advanced periodontal disease [3, 6]:

- Progressive tooth mobility, changing ridge morphology and periodontal breakdown reduced the predictability of long-term tooth retention and prosthetic support.
- Extensive tissue coverage risked plaque retention and disease acceleration.
- Smoking increased the risk of disease progression while masking inflammatory signs.
- Xerostomia increased susceptibility to plaque accumulation, discomfort, and poor retention of the prosthesis.
- Anticipated future extractions required an adaptable prosthesis design that could be modified over time.
- Attempting definitive fixed solutions risked accelerating periodontal deterioration, while delayed prosthodontic intervention risked functional decline, patient disengagement and psychological compromise [7].

The question was not what could be constructed, but what could be justified. Over-definitive treatment risked rapid obsolescence due to likely future tooth loss. As the anterior teeth had not significantly drifted or developed severe spacing/black triangles, elective early extraction for aesthetic reasons was not indicated. In cases with marked drifting, earlier removal may be justified to optimise anterior aesthetics.

BPE		
X	4	X
3	4	X

Radiographs: A full-mouth periapical radiographic series had been obtained just over one year previously and therefore was used, as there was no current clinical indication for repeat imaging.

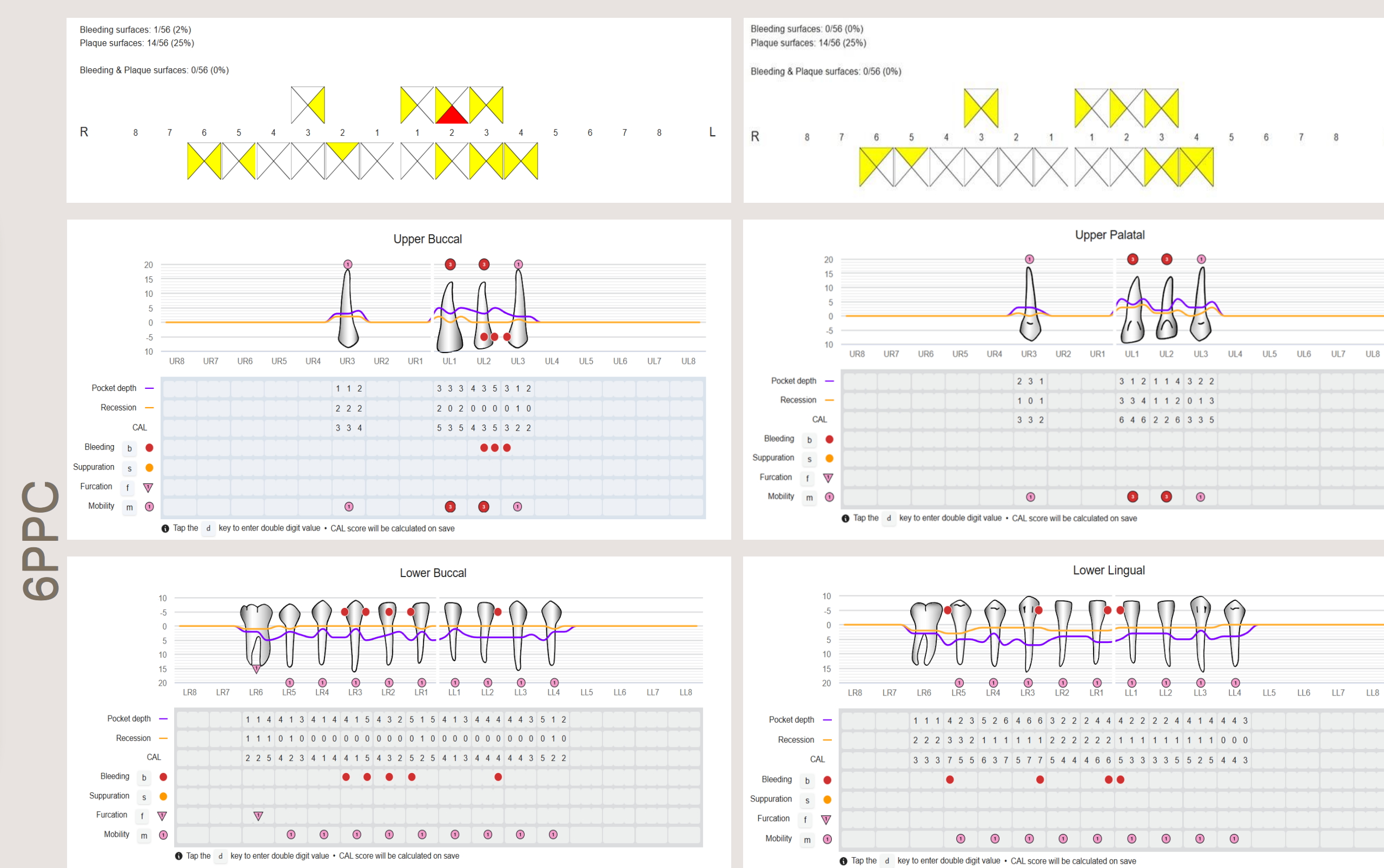


Disease Control & Risk Modification:

Prior to acquisition of the pre-operative images and any definitive prosthodontic intervention, emphasis was placed on disease stabilisation and behavioural modification [2]. This phase extended over multiple appointments and included:

1. Tailored oral hygiene instruction and interdental brush sizing.
2. Smoking cessation counselling at multiple visits (declined, documented with the risks reiterated, particularly hindrance to periodontal therapy).
3. Dietary modification with gradual reduction in sugar exposure.
4. Prescription of high-fluoride toothpaste (5000 ppm) and fluoride mouthrinse.
5. Plaque and bleeding scores to monitor engagement.
6. Non-surgical periodontal therapy (supragingival and quadrant-based subgingival PMPR under LA).
7. Strategic extractions of symptomatic, hopeless teeth were undertaken (UR4, UR2, UR1, UL4, UL5, UL6, UL8, LL6, LL5), with UR5 exfoliating naturally during treatment. Sutures were placed in the ULQ due to the large extraction field involving multiple adjacent sockets, to approximate soft tissues, promote haemostasis, and support uneventful healing.

This phase extended over multiple visits and was essential in stabilising disease activity and assessing the patient's capacity to engage with long-term maintenance — a prerequisite for prosthodontic success. Incremental improvements in plaque control and dietary habits were observed, allowing progression to advanced care while acknowledging persistent risk [6]. Referral to a periodontal specialist for advanced management was discussed; however, the patient declined due to financial constraints and her responsibilities as a full-time carer. Treatment therefore continued within the general care setting with an emphasis on supportive periodontal therapy and risk management.



Two plaque and bleeding assessments were undertaken to evaluate patient engagement, in line with British Society of Periodontology (BSP) guidelines.

Transitional Denture: A Strategic Prosthodontic Intervention.

Again, this stage was carried out prior to acquisition of the pre-operative images, as these images depict only the definitive prosthesis. Given the instability of the remaining dentition, anticipated future tooth loss, and the need to prioritise hygiene, a staged removable prosthodontic approach incorporating a transitional denture was selected. Rather than viewing the transitional acrylic denture as merely provisional, it was deliberately employed as a diagnostic and adaptive prosthesis [7, 8].

Multiple extractions were undertaken over time in response to pain, progressive mobility and deteriorating prognosis, with tooth additions and a temporary relinse carried out as required to maintain function. The patient was repeatedly counselled that this remained an interim solution, and that ongoing bone remodelling would compromise fit and retention.

- The P/- immediate denture served multiple strategic purposes:
- ✓ Restored aesthetics and function following staged extractions,
 - ✓ Allowed patient adaptation to denture wear for the first time,
 - ✓ Accommodated ongoing healing and ridge remodelling,
 - ✓ Provided insight into occlusal tolerance and hygiene capability,
 - ✓ Maintained morale and engagement during prolonged treatment,
 - ✓ and served as a transitional diagnostic solution while prognosis evolved.
- Crucially, the transitional phase provided time for disease behaviour to declare itself, for patient compliance to stabilise, and for prosthodontic decisions to be made with greater diagnostic and prognostic certainty. This period directly informed both the timing and design of the definitive prosthodontic intervention.

Post-operative:



Definitive Prosthesis Planning:

Once patient engagement and stabilisation had been achieved, a definitive removable prosthodontic solution was planned and discussed with the patient. Given the likelihood of future tooth loss, adaptability and hygiene access were prioritised over maximal tooth replacement [3, 7].

Rationale for P/- Acrylic Denture:

- Ease of modification.
- Anticipated tooth loss.
- Xerostomic comfort.

Rationale for -/P Scandinavian Co-Cr Design:

For the mandibular arch, a Scandinavian-influenced cobalt-chrome removable partial denture was selected.

Although high-quality evidence directly supporting this design philosophy is limited, its principles closely align with established prosthodontic and periodontal concepts relevant to this patient's risk profile [9, 10]:

- Minimal gingival coverage, enhancing cleansability in a plaque-susceptible patient.
- Hygienic framework design.
- Rigid cross-arch stabilisation, improving functional load distribution.
- Broad stress distribution and occlusal rest support, reducing load on compromised abutments and reliance on compromised soft tissues.
- Design adaptability, allowing for future tooth loss and modification.

Rather than claiming superiority, this design was selected as a risk-adaptive, biologically respectful solution, prioritising hygiene access and long-term manageability over maximal tooth replacement — appropriate for a periodontally vulnerable patient. This design intended to coexist with disease rather than attempt to overcome it.

Clinical Outcome:

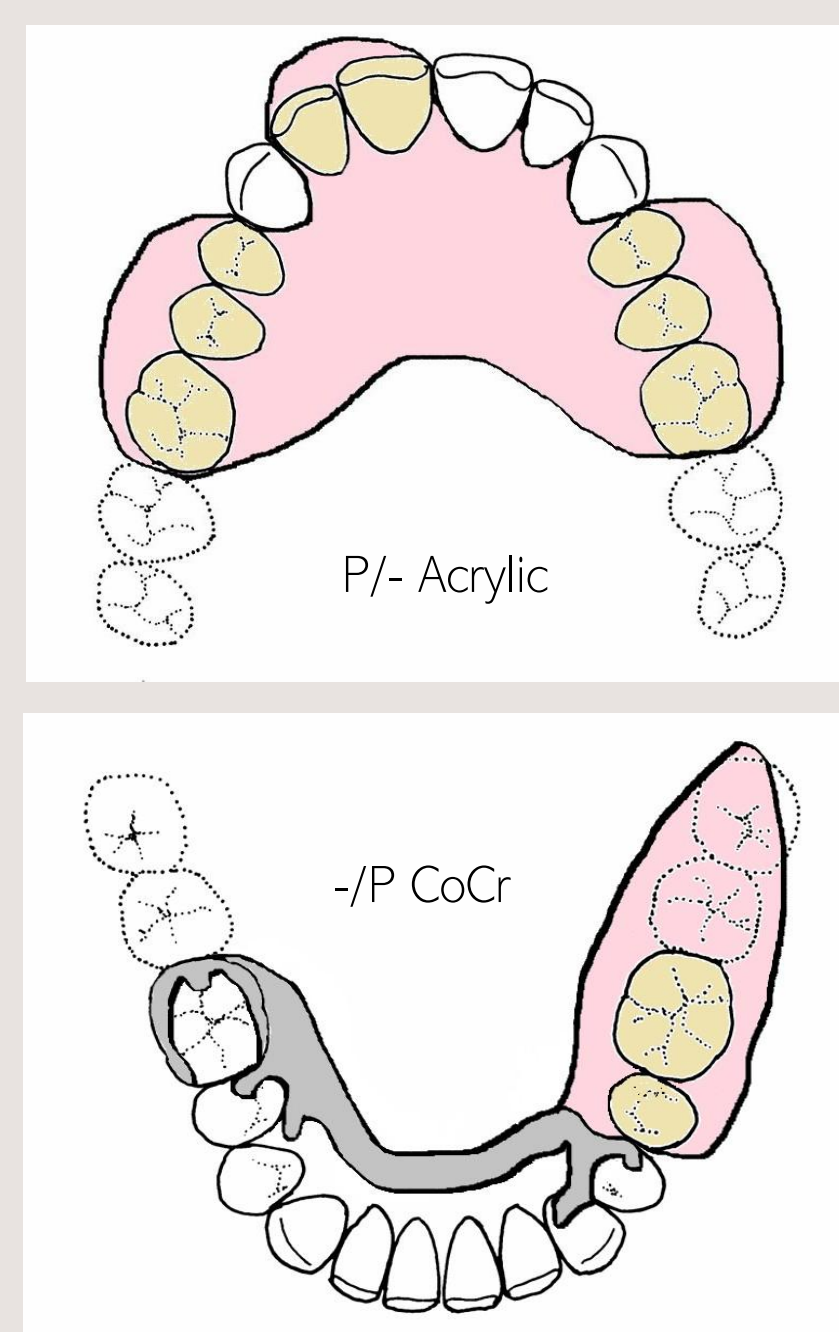
At fit, both prostheses demonstrated good retention and stability.

The patient reported:

- Significant improvement in function, confidence and aesthetics.

Improved oral health-related quality of life after prosthetic rehabilitation has been associated with greater satisfaction and motivation for oral hygiene and maintenance behaviours in the literature [11].

Ongoing reviews highlighted the dynamic nature of periodontal disease, reinforcing the need for continued monitoring and potential future prosthetic modification. Importantly, the patient demonstrated sustained engagement with maintenance visits and periodontal monitoring.



Reflection:

This case fundamentally reshaped my understanding of what constitutes 'advanced' prosthodontics. While technically modest, it demanded sustained reflective decision-making and ethical clarity. The complexity lay in restraint — resisting overtreatment — and in accepting that prosthodontic success may be measured by adaptability with a declining periodontal foundation rather than longevity [6, 7].

A pivotal learning point was the discipline of biological prioritisation and consciously resisting the urge to pursue definitive solutions prematurely in favour of appropriate, adaptable care. Periodontal status dictated design, material choice, and timing. Negotiating the balance between patient expectations and a prosthodontic outcome that was biologically defensible was essential. While implant-supported fixed prostheses may have offered superior retention and aligned with the patient's initial preferences, advanced periodontal disease and ongoing smoking significantly compromised implant suitability. Shared decision-making, supported by active listening, enabled treatment planning that respected patient priorities over idealised clinician-led solutions. Implant therapy was discussed as a potential future option only following sustained periodontal stability over a minimum of two years, acknowledging heightened risks of peri-implantitis and the possible need for grafting in the context of severe bone loss. Ultimately, the agreed treatment represented a pragmatic compromise: not the most definitive option, but one aligned with the patient's values, risk tolerance, and capacity for maintenance. This reinforced that prosthodontic success is defined not solely by technical superiority, but by ethical appropriateness and long-term sustainability within compromised biological context. The transitional denture emerged not as a temporary compromise, but functioned as a diagnostic tool, a behavioural barometer, and a psychological anchor for the patient. It allowed prosthodontic decisions to mature alongside disease control. In this context, the Scandinavian design philosophy aligned closely with the principles of cleansability, favourable load distribution, future modification and biological realism [9]. Despite absence of robust comparative evidence and its relatively limited use within undergraduate education, this approach was particularly appropriate for a patient at high risk of continued attachment loss, where planning for the loss of future teeth was as critical as managing those currently present. This represents a shift from outcome-driven dentistry to process-driven care. This case highlighted the importance of meticulous radiographic technique, as early coming-off errors reinforced my commitment to improving beam alignment and positioning. In future treatment planning, I intend to audit radiographic quality to ensure diagnostic accuracy. Overall, this case reframed my perception of prosthodontic success. The measure of achievement was not technical sophistication, but the prosthesis' ability to evolve alongside disease progression without compromising hygiene or patient comfort. It reinforced that ethical prosthodontics requires humility, foresight, and acceptance of biological limitations. Ultimately, this case demonstrated that the most sophisticated prosthodontics is often quiet, cautious, and grounded in respect for clinical limits and disease processes balanced with technical skill.

References:

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