# Fixed Prosthodontics

## 1. Principles Pertinent to the Evaluation Criteria

### Objectives

The treatment of a patient with fixed dentures aims at the restoration of chewing comfort and esthetics, considering the needs of the patient and maintaining or creating healthy conditions.

### Prerequisites for Successful Fixed Prosthodontics

Prior to the fixed prosthetic reconstruction proper a comprehensive preparatory dental treatment often has to be carried out in order that the periodontium- or implant-supported denture has a good long-term prognosis associated with an as small as possible percentage of biological and technical failures.

The maintenance or restoration of healthy periodontal and endodontic conditions normally is the basic requirement for the successful completion of any fixed prosthetic measure (Nyman & Lindhe 1979). It is self-evident that thereby the collaboration of the patient plays an essential role. An uncooperative patient or a patient who gives only little significance to their oral hygiene gains little by elaborate prosthetic reconstructions. Hence, when treating partially dentate, but uncooperative patients, fixed prosthetic reconstructions should be designed as simply as possible and remain limited to a minimum acceptable level regarding chewing comfort and esthetics.

### Planning Principles for Successful Fixed Prosthodontics

It should be understood that the prosthetic treatment of a patient requires a synoptic, i.e. comprehensive treatment plan which takes into account the individual needs, the general medical and dental findings, the socioeconomic environment, and the clinical competence of the practitioner. For the elaboration of such a treatment plan, an appropriate conventional or digital documentation is to be created, which at least comprises the periodontal, cariological, endodontic, and functional aspects of the patient. The course of treatment can include single or several digital processes.

The following treatment principles may be directive when elaborating a comprehensive therapy plan:

- Treatment of plaque-related diseases (caries, periodontitis) as opportunistic infections
- Setting of priorities regarding the control of plaque-related infections
- Pre-prosthetic diagnostics of acid activity for the assessment of the risk of erosion
- Restoration of healthy oral conditions before consideration of esthetics and chewing comfort
- Pre-therapeutic risk assessment of the chewing elements (teeth, roots) and classification into the categories safe (prognostically good), doubtful, or unworthy of treatment
- Compliance with a strict sequence of treatment comprising
  1. systemic phase
  2. pre-preparatory or hygienic phase
  3. corrective phase
  4. caring phase
- Assessment of the subjective chewing capability: a denture as far as the completion of the tooth rows is rarely indicated
- Taking into account that the shortened tooth row, often limited to premolar occlusion, can constitute a treatment objective which is subjectively satisfactory for the patient
- Improvement of the subjective chewing comfort in the form of premolar units, if necessary by means of the incorporation of oral implants back to the first molar
- Treatment planning focusing on minimally invasive and defect-oriented treatment (preparation and reconstruction)
- Continuous diagnostic processes during the post-therapeutic care
- Supportive therapy determined by diagnostics during the lifelong maintenance and caring phase

### Treatment Principles

Concerning the prevention of technical failures certain rules apply, which attain particular significance in the context of the fixed reconstruction of partially dentate jaws:

- Smaller reconstructions are preferable to extensive, blocked reconstructions (principle of segmentation).
- Permanent splinting (blocking of entire dental arches by means of extensive reconstructions) are worth striving for only in cases of severely reduced, but healthy periodontium.
- Non-vital abutment teeth constitute an increased risk of root fractures in the context of cantilever bridges.

- Systematic reinforcement of root canals using root posts can entail weakening of the non-vital tooth. The preservation of as much as possible of the dentin core is to be prioritized.
- Owing to the possibilities of adhesive insertion, nowadays, minimally invasive and defect-oriented reconstructions are often preferable (principle of preservation of tooth substance [in particular enamel]).

## Manufacturing Principles (Procedures)

Basically, the working steps can be acquired conventionally or by using digital processes:

- Classical manual workflow on natural abutment teeth or implants
- CADCAM methods on natural abutment teeth or implants

With both methods minimally invasive techniques can be applied, in which particular attention is directed to maximum preservation of tooth substance (inlay, onlay, overlay).

## Design Principles

Never ever should a reconstruction restrict or even hinder the possibilities of the patient to pursue an optimal oral hygiene. In this connection, the biologically oriented design of the problem zones of fixed classical, CAD-CAM, or minimally invasive reconstructions (interventions), irrespective of whether tooth- or implant-supported, is to be recalled:

- High marginal accuracy of fit associated with an easily accessible position of the restoration margin (of diverse materials), particularly in regions in which esthetic aspects are of no superior importance
- Cleanability of the interdental spaces and optimal design of the connectors between the bridge abutments and the pontics considering the individual morphology of the papilla
- Creation of shallow axial contours of the crowns and pontics ("emergence profile")
- Convex design of the undersides of the pontics
- Design of the occlusal complex according to a therapeutic occlusion concept taking into account the individual conditions of the patient; "freedom in centric" is a scientifically sound and clinically tested occlusion concept which can be recommended for both simple and extensive reconstructions.

## Assessments of Success

As a consequence, the general treatment objective outlined at the beginning always has to comprise the following superior elements:

- Best possible, predictable long-term success (i.e. not only "survival", but truly "success" in functional, biological, technical, and esthetic respect), as far as possible based on scientifically proved insights in the sense of evidence-based dental medicine
- Consideration of the patient-related circumstances which always have to be defined individually:
  - Request of the patient regarding chewing function, esthetics, and subjective comfort
  - Balanced cost-benefit ratio
  - Financial scope
  - Local anatomic conditions (although today virtually everything is technically possible, nevertheless not all possibly existing defects or deviations from the norm should/could reasonably be adjusted)

## 2. Evaluation Criteria for the Quality Levels A+ to C

| | DESCRIPTION | ESTHETICS (FORM, COLOR, TEXTURE) |
|---|---|---|
| **A+** | ▪ The work is successful and the patient perceives it as integral part of their dentition. | ▪ Reconstructions which at speaking distance are not recognized as such either by the patient or the practitioner |
| **A** | ▪ Any good reconstruction which does not give rise to an appreciable disadvantage in the field of oral health<br>▪ Function, subjective comfort, accuracy of fit, cleanability, and appearance are adequate.<br>▪ Stable occlusal conditions<br>▪ The work is successful and matched to the needs and socioeconomic conditions of the patient. | ▪ The area of the fixed reconstruction visible upon normal function (e.g. speaking, laughing) is in the range of generally accepted esthetic criteria or meets the explicit request of the patient. |
| **B** | ▪ Reconstructions exhibiting objectifiable, although reversible imperfections (such as occlusal interferences or sites hardly amenable to cleaning); imperfections resulting in drawbacks for health have to be adjusted.<br>▪ Imperfections (e.g. of esthetic nature), which do not compromise oral health, may be adjusted at the request of the patient.<br>▪ Needs and socioeconomic conditions of the patient insufficiently considered | ▪ Color incorrect by one degree<br>▪ Gleaming skeleton<br>▪ Discolored<br>▪ Visible margins |
| **C** | ▪ Reconstructions which result or already have resulted in considerable, irreversible drawbacks in the range of function, periodontium, pulp, occlusion, neighboring tooth, or appearance.<br>▪ Failure attributed to insufficient diagnosis, inadequate planning, deficient implementation, or technical flaws<br>▪ A new or alternative treatment is inevitable. | ▪ Esthetically inacceptable, i.e. the work appears objectively disfiguring.<br>▪ One or several of the following aspects are clearly objectifiably incorrect: color, form, width, length, and position of the prosthetic elements. |

| | STRUCTURAL AND BIOLOGICAL INTEGRITY | MARGINAL ACCURACY OF FIT |
|---|---|---|
| **A+** | – | ▪ Reconstruction margin cannot be probed. |
| **A** | ▪ Healthy periodontium or successfully completed periodontal treatment<br>▪ Healthy pulp or successfully completed root treatment (including buildup of any stumps)<br>▪ Adequate form of preparation, retention, and resistance in the area of the prepared abutment teeth<br>▪ Margins of reconstruction and crowns as well as interdental spaces are amenable to cleaning by the patient.<br>▪ Correct design of the interproximal contact areas | ▪ Harmonious transition from the reconstruction margin to the tooth or root surface<br>▪ Radiographically tight restoration margin |
| **B** | ▪ Insufficient root canal filling **without** symptoms or periapical pathology<br>(in an exceptional case, e.g. an elderly or uncooperative patient, an appropriate therapy can be renounced in the sense of a deliberately adopted compromise; a respective note in the patient chart is advisable.)<br>▪ Slightly impaired health condition of the periodontium<br>▪ Failure to respect the biologic width<br>▪ Excess cement (beware of: composite resin cement). | ▪ Slight deficiency or excess of the reconstruction margin |
| **C** | ▪ Active pathology in the area of the periodontal supporting tissues attributable to a forborne periodontal treatment or insufficient amenability to hygiene of the reconstruction<br>▪ Insufficient root canal filling associated with symptoms and/or a periapical pathology<br>▪ Insufficient form of retention and resistance of the prepared abutment teeth<br>▪ Insufficient interproximal contact area (food impaction). | ▪ Greatly open reconstruction margin (>200 µm) associated with respective access to probing<br>▪ Massive deficiency/excess of the restoration margin |

| | OCCLUSION | AFTERCARE |
|---|---|---|
| **A+** | – | – |
| **A** | ▪ Multicontact situation in maximum intercuspation<br>▪ Interference-free canine or group guidance<br>▪ "Long centric" lacking any noteworthy transversal sliding movement from centric relation to maximum intercuspation | ▪ Individual, structured aftercare program<br>▪ Regular periodontal and dental screening<br>▪ Radiographic checks according to the ALARA principle<br>▪ Stable asymptomatic condition maintained |
| **B** | ▪ Slight occlusal interferences (balancing side contacts, premature contacts on working side) lacking any related symptoms | ▪ Suggestion for aftercare has been made, however there is no organizational support.<br>▪ Inadequate periodontal, dental, and radiographic screening |
| **C** | ▪ Severe occlusal interferences<br>▪ Missing contacts in maximum intercuspation<br>▪ Deficient occlusal plane | ▪ Aftercare is neither offered nor organized and carried out.<br>▪ No periodontal, dental, and radiographic screening |

## 3. Explanatory Notes

Today, fixed prosthetic work indisputably can satisfy paramount demands regarding precision, subjective and objective function, as well as – if applicable – regarding natural esthetics. Prerequisites for this are comprehensive transdisciplinary diagnostic knowledge and superior clinical-technical skills. Due to the marked invasiveness and also cost-intensiveness of this form of therapy, the associated main objective has to be the long-term success. Apart from the consideration of the individual needs and expectations of the patient, primarily structure-preserving reflections have priority. In particular the risk of biological (periodontitis, endodontic complications) and mechanical (fractures, loss of retention) failures is to be assessed realistically. A **meaningful quality management** for the field of fixed prosthodontics therefore relies as far as possible on scientifically verified data and easily comprehensible standards, whereby apart from the **treatment result** proper especially the **accompanying circumstances** (requests/needs of the patient, initial findings, complexity of the treatment, and much more) as well as ultimately also the **follow-up quality** are to be included (Anusavice 1989; California Dental Association 1977; Glantz 1989; Ryge 1980; Ryge & De Vincenzi 1983; Ryge 1989; Thompson & De Rijk 1989; Royal College of Surgeons of England 1991).

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