the subgingival debridement group and 0-14% in the AF. There were no statistically significant differences in PROMs between the interventions.

Intervention: different access flaps procedures

The second relevant question was whether there are specific surgical conservative surgical procedures that are more efficacious for achieving the end points of in the treatment of periodontitis stage III patients.

Conservative surgical procedures have been defined as those aiming to access the affected root surfaces without eliminating significant amounts of hard and soft tissues. These procedures have been classified depending on the amounts of marginal gingiva and interdental papillary tissue removal into:

- open flap debridement with intra-sulcular incisions (OFD);
- flaps with para-marginal incisions, such as modified Widman flap (MWF) and
- papilla preservation flaps.

How effective are the different access flap procedures?

Evidence-based recommendation (3.2)
In cases of deep (PPD ≥ 6 mm) residual pockets and intrabony defects in patients with periodontitis stage III after adequate first and second steps of periodontal therapy, there is insufficient evidence for a recommendation on the choice of flap procedures. Access periodontal surgery can be carried out using different flap designs.
Supporting literature (Sanz-Sanchez et al., 2020)
Quality of evidence: Three RCTs compared MWF with OFD. One RCT compared the efficacy of papilla preservation flaps (single flap approach versus OFD) in the presence of intrabony pockets. Two RCTs compared minimally invasive surgery with conventional surgery. Moderate to high risk of bias. Limited available data.
Grade of recommendation Grade 0 - ↔
Strength of consensus Consensus (0% of the group abstained due to potential CoI)

Background

Available evidence. Out of three available studies comparing MWF with OFD, only one showed statistically significantly greater PPD reduction for MWF than OFD. There were no statistically

significant differences in % PPD reduction in deep infrabony pockets between papilla preservation flap (single flap approach) and conventional flaps (one study). Two studies comparing minimally invasive surgery with conventional surgery did not demonstrate a significant added value in PPD reduction or CAL gain.

Intervention: resective flap procedures

The third relevant question was whether resective flap procedures (those that, in addition to gaining access for subgingival debridement, aim to change the architecture of the hard and/or the soft tissues to attain shallow probing depths) are more efficacious than conservative surgical procedures in achieving the endpoints of periodontal in the treatment of periodontitis stage III patients.

What is the efficacy of pocket elimination/reduction surgery in comparison with access flap surgery?

Evidence-based recommendation (3.3)
In cases of deep (PPD ≥ 6 mm) residual pockets in patients with periodontitis stage III after an adequate second step of periodontal therapy, **we suggest** using resective periodontal surgery, yet considering the potential increase of gingival recession.
Supporting literature (Polak et al., 2020)
Quality of evidence: 9 RCTs (4 could be used for the quantitative analysis). High risk of bias. Limited available data.
Grade of recommendation Grade B - ↑
Strength of consensus Simple Majority (2.6% of the group abstained due to potential CoI)

Background

Available evidence. Resective periodontal surgery attained statistically significantly higher PPD reduction than access flaps at 6 months (WMD= 0.59 mm; 95% CI [0.06-1.12]) and one year (WMD=0.47 mm; 95% CI [0.24; 0.7]). For pockets 4-6 mm differences were statistically significant at 1 year (WMD=0.34 mm; 95% CI [0.19; 0.48]), while pockets 7 mm or deeper showed greater difference between the groups (WMD=0.76 mm; CI [0.35; 1.17]). The differences were lost with time (3- and 5-year follow-up). There were no differences in CAL gains between the surgical modalities in the long term (3-5 years). Post-operative recession was statistically

significantly greater following resective surgery than access flaps at 1-year post-op (two studies). No differences reported at 5 years follow-up (one study). No differences in recession over time in initially shallow pockets between the two modalities.

Risk of bias. High risk of bias, scarcity of quantitative data (only 4 RCTs).

Clinical relevance and effect size. The paucity of the data on percentage of shallow pockets or incidence of re-treatment prevents assessments of the clinical relevance of the differences.

Balance of benefit and harm. Data on PROMs, the percentage of residual pockets or the need of re-treatment were not reported in any of the studies.

General recommendations for periodontal surgical procedures

What is the level of care required for management of deep residual pockets with or without presence of intrabony defects or furcation involvement after completion of steps 1 and 2 of periodontal therapy?

Expert consensus-based recommendation (3.4)
Surgical treatment is effective but frequently complex and **we recommend** that it is provided by dentists with additional specific training or by specialists in referral centres. **We recommend** efforts to improve access to this level of care for these patients.
Supporting literature Expert opinion
Grade of recommendation: Grade A - ↑↑
Strength of consensus Consensus (0% of the group abstained due to potential CoI)

Background

Intervention. Advanced periodontal surgery (regenerative and furcation management) is beyond the scope and competence of education in general dental practice (Sanz & Meyle, 2010). Dental curricula include knowledge and familiarity with the approach but are not designed to provide competence to conduct such treatment: additional specific training is required and is available through continuing professional development and periodontal learned societies in most countries. Post-graduate periodontal education, on the other hand, is specifically designed to provide competence and proficiency towards the resolution of such complex problems (Sanz, van der Velden, van Steenberghe, & Baehni, 2006; Van der Velden & Sanz, 2010).

If expertise is not available or referral is not an option, what is the minimum level of primary care required for management of residual pockets associated with or without intrabony defects or furcation involvement after completion of steps 1 and 2 of periodontal therapy?

Expert consensus-based recommendation (3.5)
As a minimum requirement, **we recommend** repeated scaling and root debridement with or without access flap of the area in the context of high-quality step 1 and 2 treatment and a frequent program of supportive periodontal care including subgingival instrumentation.
Supporting literature Expert opinion [and systematic reviews for access flaps (Graziani et al., 2012; Graziani et al., 2015)]
Grade of recommendation Grade A - ↑↑
Strength of consensus Consensus (0% of the group abstained due to potential CoI)

Background

Intervention. Dental services are organized differently in various countries. Some are structured in both primary care and specialist care (usually delivered by referral to dental hospitals or specialist practices/centres); in other countries dental services are based on a single level of care and interested general practitioners acquire broader periodontal skills through continuing professional development. Optimal management of stage III and stage IV periodontitis remains limited in most health systems with significant inequalities in availability and access to advanced/specialist periodontal care. There is an urgent need to improve patient access to the appropriate level of care given the high burden and costs associated with the sequelae of unmanaged severe (stages III and IV) periodontitis.

What is the importance of adequate self-performed oral hygiene in the context of surgical periodontal treatment?

Expert consensus-based recommendation (3.6)
We recommend not to perform periodontal (including implant) surgery in patients not achieving and maintaining adequate levels of self-performed oral hygiene.
Supporting literature Expert opinion

Grade of recommendation Grade A - ↑↑
Strength of consensus Strong consensus (0% of the group abstained due to potential CoI)

Background

Intervention. Proof of principle studies conducted in the 1970s have pointed to the negative effects (clinical attachment loss) of performing periodontal surgery in subjects with inadequate plaque control (Nyman, Lindhe, & Rosling, 1977; Rosling, Nyman, Lindhe, & Jern, 1976). Multiple RCTs on surgical periodontal intervention have shown a dose dependent effect of plaque control on healing outcomes. Similar data have been reported after implant surgery (van Steenberghe et al., 1990). The level of self-performed oral hygiene is clinically assessed using a plaque control record [for an example, see (O'Leary, Drake, & Naylor, 1972)]. Plaque scores smaller than 20-25% have been consistently associated with better surgical outcomes (see step 1 and SPC clinical recommendations for detailed discussions on how to facilitate achieving stringent levels of self-performed oral hygiene).

Intervention: Management of intrabony defects

What is the adequate management of residual deep pockets associated with intrabony defects?

Evidence-based recommendation (3.7)
We recommend treating teeth with residual deep pockets associated with intrabony defects 3 mm or deeper with periodontal regenerative surgery.
Supporting literature (Nibali et al., 2019)
Quality of evidence: 22 RCTs (1182 teeth in 1000 patients) – 4 studies at low risk of bias – there is consistency of direction of benefit but high heterogeneity for superiority of regeneration over open flap debridement.
Grade of recommendation Grade A - ↑↑
Strength of consensus Consensus (10% of the group abstained due to potential CoI)

Background

Intervention. See previous sections. An algorithm for clinical decision making in the treatment by regenerative surgical therapy of intrabony defects and residual pockets is depicted in Figure 1.

Available evidence. The evidence base includes 22 RCTs with 1000 patients. The quality of the evidence was rated as high.

Risk of bias. Study quality assessment identified 4 studies at low risk of bias and 15 studies at unclear risk of bias.

Consistency. Regenerative surgical therapy resulted in improved clinical outcomes (shallower pockets and higher CAL gain) compared with open flap debridement in the majority of studies. No indication of publication bias was observed. Moderate to substantial heterogeneity in the size of the adjunctive effect was observed. This could be partly explained by the use of specific biomaterials or flap designs.

Clinical relevance and effect size. The mean adjunctive benefit reported was 1.34 mm (95% CI [0.95; 1.73]) in CAL gain and 1.20 mm (95% CI [0.85; 1.55]) in pocket depth reduction. This represented an 80% (95% CI [60%; 100%]) improvement compared to the controls. A mean difference of this magnitude is deemed clinically relevant as it has the potential of decreasing risk of tooth loss. Observational and experimental studies reporting on tooth survival for a period of 3 to 20 years show improved tooth retention with periodontal regeneration in teeth under regular supportive periodontal therapy [28 RCTs summarized in (Stavropoulos et al., 2020)].

Balance of benefit and harm. No serious adverse event was reported in any of the studies included in the systematic review. The adverse events associated with regenerative therapy included local adverse events (wound failure) and post-operative morbidity. No specific harm has been reported after regenerative surgery. Potential risk for disease transmission from well documented human-derived or animal-derived regenerative biomaterials is considered extremely low.

Ethical considerations. The perception that regenerative treatment of deep intrabony defects results in better outcomes than access flap is commonly held in the research and clinical community. Therefore, maximum tissue preservation flap with the application of documented regenerative biomaterials should be the standard of care. This perception is supported by the observation that only 22 of 79 RCTs included in the systematic review used access flap as the control and the majority of the body of evidence compared different regenerative techniques/biomaterials.

Regulatory consideration. It is important to emphasise that only few classes of regenerative materials are registered in Europe. In each class, only few materials satisfy the evidence base criteria set forth by these guidelines and the considerations should not be applied to materials that

have not been adequately tested. Implementation of the new EU medical device regulations will prove useful.

Economic considerations. Regenerative surgery is more expensive than access flap surgery but cheaper than tooth replacement necessary as a consequence of tooth loss. In the absence of health-economic data in RCTs included in the review, a pilot study has indicated that the initial increase in cost of regeneration is associated with lower cost of managing recurrence over a 20-year period (Cortellini, Buti, Pini Prato, & Tonetti, 2017).

Patient preferences. No data are available about patient preference or acceptability. Religious issues may be present for segments of the population since some of the regenerative materials are of porcine or bovine origin. While the use for medical reasons is generally acceptable and has been approved by religious leaders, the sensitivity of individual subjects may pose a barrier.

What is the adequate choice of regenerative biomaterials for promoting healing of residual deep pockets associated with a deep intrabony defect?

Evidence-based recommendation (3.8)
In regenerative therapy, **we recommend** the use of either barrier membranes or enamel matrix derivative with or without the addition of bone-derived grafts*
Supporting literature (Nibali et al., 2019)
Quality of evidence: 20 RCTs (972 patients) – 4 studies at low risk of bias – moderate to high heterogeneity for superiority of these biomaterials
Grade of recommendation Grade A - ↑↑
Strength of consensus Consensus (18.1% of the group abstained due to potential CoI)

*Clinicians should select a specific biomaterial to be used to promote regeneration at intrabony defects (or class II furcation involvements) based on satisfaction of all of the following criteria (Proceedings of the 1996 World Workshop in Periodontics, 1996): i) availability of solid preclinical research identifying plausible mechanism(s) of action leading to periodontal regeneration; ii) human histological evidence of regeneration in the specific application; and iii) evidence of efficacy in applicable, high quality randomized controlled clinical trials. While there are biomaterials that satisfy all these criteria, it must be understood that many biomaterials do not meet them in spite of being CE ("Conformité Européene") marked or Food and Drug Administration (FDA) approved/cleared.

Background

Intervention. See previous sections.

Available evidence. The evidence base includes 20 RCTs with 972 patients. The quality of the evidence was considered to be high.

Risk of bias. Study quality assessment identified 4 studies at low risk of bias and 15 studies at unclear risk of bias.

Consistency. Regenerative surgical therapy with a variety of biomaterials resulted in improved clinical outcomes compared with open flap debridement in the majority of studies. No indication of publication bias was observed. Moderate to substantial heterogeneity in the size of the adjunctive effect was observed.

Clinical relevance and effect size. The mean adjunctive benefit in term of CAL gain was 1.27 mm (95% CI [0.79; 1.74], equivalent to a 77% improvement) for EMD and 1.43 mm (95% CI [0.76; 2.22], equivalent to an 86% improvement) for guided tissue regeneration (GTR) compared with OFD. The combination of membrane with bone-derived graft resulted in higher CAL gain of 1.5 mm (95% CI [0.66; 2.34], equivalent to a 90% improvement) compared with OFD. The comparison between EMD versus GTR resulted in no statistically significant difference in CAL gain. The choice of biomaterial or possible combinations should be based on defect configuration.

What is the adequate choice of surgical flap design for the regenerative treatment of residual deep pockets associated with an intrabony defect?

Evidence-based recommendation (3.9)
We recommend the use of specific flap designs with maximum preservation of interdental soft tissue such as papilla preservation flaps. Under some specific circumstances, we also **recommend** limiting flap elevation to optimize wound stability and reduce morbidity.
Supporting literature (Graziani et al., 2012; Nibali et al., 2019)
Quality of evidence: ancillary evidence arising from systematic reviews and expert opinion.
Grade of recommendation Grade A - ↑↑
Strength of consensus Consensus (2.8% of the group abstained due to potential CoI)

Background

Intervention. See previous sections.

Available evidence. The evidence base includes two systematic reviews.

Risk of bias. Study quality assessment identified five studies at low risk of bias and 15 studies at unclear risk of bias.

Consistency. No conclusion can be drawn.

Clinical relevance and effect size. Papilla preservation flaps have been shown to lead to increased CAL gain and PD reduction as well as reduced post-surgical recession compared with OFD.

Balance of benefit and harm. No serious adverse event has been reported after application of papilla preservation flaps in regenerative periodontal surgery performed by adequately trained clinicians. The added complexity of the surgery requires additional training.

Applicability. Anatomical considerations related to the width of the interdental space advise on the choice of the preferred flap design to access the interdental area (Cortellini, Prato, & Tonetti, 1995, 1999). Location and configuration of the intrabony defect advise on the possibility to: i) minimize flap extension (Cortellini & Tonetti, 2007; Harrel, 1999); ii) raise a single flap or the need to fully elevate the interdental papilla (Cortellini & Tonetti, 2009; Trombelli, Farina, Franceschetti, & Calura, 2009).

Intervention: Management of furcation lesions

What is the adequate management of molars with class II and III furcation involvement and residual pockets?

Evidence-based recommendation & statement (3.10)
A. **We recommend** that molars with class II and III furcation involvement and residual pockets receive periodontal therapy. B. Furcation involvement is no reason for extraction.
Supporting literature (Dommisch et al., 2020; Jepsen et al., 2019)
Quality of evidence: Regenerative treatment: 20 RCTs (575 patients) Resective treatment: 7 observational studies (665 patients) with low quality of evidence
Grade of recommendation A. Grade A - ↑↑ B. Statement

A. ***Strength of consensus*** Strong consensus (1.5% of the group abstained due to potential CoI)
B. ***Strength of consensus*** Consensus (1.5% of the group abstained due to potential CoI)

Background

Intervention. See previous sections. An algorithm for clinical decision making in the treatment by periodontal surgery of molars with furcation involvement (class I, Class II) and residual pockets is depicted in Figure 2.

Available evidence. The evidence base includes 20 RTCs with 575 patients (class II buccal/lingual mandibular and maxillary buccal furcation involvement) and 7 observational studies with 665 patients (class II interproximal and class III). Previous systematic reviews have addressed the clinical performance of periodontal therapy of teeth with furcation involvement (Huynh-Ba et al., 2009; Nibali et al., 2016).

Risk of bias. High quality of evidence of RCTs. Low quality of evidence for observational studies.

Consistency. Following treatment, moderate to substantial heterogeneity in the size of the effect (wide ranges of tooth survival) was observed. The reasons cannot be determined from the existing data.

Clinical relevance and effect size. Following treatment, reasonable survival rates were observed over 4 to 30.8 years. Overall, the observed tooth survival rates were better in class II furcation involvement than class III.

Balance of benefit and harm. We did not identify data about harm directly related to procedures.

Economic considerations. Simulations based on the German health system have indicated that tooth retention after complex periodontal therapy of teeth with furcation involvement is more cost-effective than their extraction and replacement with an implant supported fixed partial denture (Schwendicke, Graetz, Stolpe, & Dorfer, 2014). A study assessing the actual cost of retention of molars in the same health system showed that cost for retaining periodontally compromised molars were minimal (Schwendicke, Plaumann, Stolpe, Dorfer, & Graetz, 2016).

Patient preferences. There is a strong patient preference for tooth retention (IQWiG, 2016).

Applicability. The guideline can be applied since it is independent of availability of materials and a segment of the dental workforce has been trained or can be trained to deliver surgical furcation treatment in the different European health systems.

What is the adequate management of residual deep pockets associated with mandibular class II furcation involvement?

Evidence-based recommendation (3.11)
We recommend treating mandibular molars with residual pockets associated with class II furcation involvement with periodontal regenerative surgery.
Supporting literature (Jepsen et al., 2019)
Quality of evidence: 17 RCTs ≥ 12 months (493 patients).
Grade of recommendation Grade A - ↑↑
Strength of consensus Consensus (7.6% of the group abstained due to potential CoI)

Background

Intervention. See previous sections.

Available evidence. The evidence base includes 17 RCTs with 493 patients. The quality of the evidence for the statement was assessed according to GRADE and considered to be high. In the systematic review underlying this recommendation (Jepsen et al., 2019), a standard meta-analysis grouping all regenerative techniques versus OFD was performed altogether with ancillary analysis. Results indicated that regenerative therapies had a significant benefit over OFD in terms of both primary and surrogate outcomes.

Risk of bias. Study quality assessment identified an unclear risk of bias for the majority of the studies. Bearing in mind that six papers failed to disclose support and seven papers reported industry funding for the research.

Consistency. Regenerative treatment consistently demonstrated added benefits (in terms of furcation improvement, horizontal bone gain, horizontal and vertical attachment gain, pocket reduction) in comparison to OFD.

Clinical relevance and effect size. The mean adjunctive benefit of a regenerative treatment is clinically relevant (1.3 mm vertical CAL and greater PPD reduction) and the effect size is significant as furcation improvement showed an odds ratio (OR) of 21 (Bayesian credible interval 5.8 to 69.4) in favour of regenerative techniques.

Balance of benefit and harm. The benefit of regenerative therapies to promote tooth retention outweighs the adverse events which consist mainly of local wound failure.

Ethical considerations. The perception is that regenerative therapies to promote tooth retention are preferred over tooth extraction (and replacement) or open flap debridement

Regulatory consideration. All the studies reported FDA or CE-approved devices.

Economic considerations. Regenerative surgery has additional costs, which appear to be justified by the added benefits (furcation improvements).

Patient preferences. Minimal data are available.

Applicability. Teeth presenting with favourable patient, tooth and defect related conditions.

What is the adequate management of residual deep pockets associated with maxillary buccal class II furcation involvement?

Evidence-based recommendation (3.12)
We suggest treating molars with residual pockets associated with maxillary buccal class II furcation involvement with periodontal regenerative surgery.
Supporting literature (Jepsen et al., 2019)
Quality of evidence: 3 RCTs ≥ 12 months (82 patients).
Grade of recommendation Grade B - ↑
Strength of consensus Consensus (8.5% of the group abstained due to potential CoI)

Background

Intervention. See previous sections.

Available evidence. The evidence base includes 3 RCTs with 82 patients (de Santana, Gusman, & Van Dyke, 1999; Garrett et al., 1997; Hugoson et al., 1995). The quality of the evidence for the statement was assessed according to GRADE and considered to be moderate. Of these studies only one (de Santana et al., 1999) had a clear comparison towards OFD indicating an added benefit.

Risk of bias. Study quality assessment identified an unclear/high risk of bias.

Consistency. Regenerative treatment demonstrated added benefits.

Clinical relevance and effect size. It cannot be extrapolated.

Balance of benefit and harm. The benefit of regenerative therapies to promote tooth retention outweigh the adverse events which consist mainly of local wound failure.

Ethical considerations. The expert perception is that regenerative therapies to promote tooth retention are preferred over tooth extraction or open flap debridement.

Regulatory consideration. All the studies reported FDA or CE-approved devices.

Economic considerations. Regenerative surgery has additional costs which appear to be justified by the added benefits (furcation improvements).

Patient preferences. No data are reported.

Applicability. Teeth presenting with favourable patient, tooth and defect related conditions.

What is the adequate choice of regenerative biomaterials for the regenerative treatment of residual deep pockets associated with class II mandibular and maxillary buccal furcation involvement?

Evidence-based recommendation (3.13)
We recommend treating molars with residual pockets associated with mandibular and maxillary buccal class II furcation involvement with periodontal regenerative therapy using enamel matrix derivative alone or bone-derived graft with or without resorbable membranes*
Supporting literature (Jepsen et al., 2019)
Quality of evidence: 17 RCTs ≥ 12 months (493 patients) for mandibular class II, 3 RCTs ≥ 12 months (82 patients) for maxillary buccal class II, and support from indirect evidence, expert opinion.
Grade of recommendation Grade A - ↑↑
Strength of consensus Simple majority (12.7% of the group abstained due to potential CoI)

*Clinicians should select a specific biomaterial to be used to promote regeneration at intrabony defects (or class II furcation involvements) based on satisfaction of all of the following criteria (Proceedings of the 1996 World Workshop in Periodontics, 1996): i) availability of solid preclinical research identifying plausible mechanism(s) of action leading to periodontal regeneration; ii) human histological evidence of regeneration in the specific application; and iii) evidence of efficacy in applicable, high quality randomized controlled clinical trials. While there are biomaterials that satisfy all these criteria, it must be understood that many biomaterials do not meet them in spite of being CE marked or FDA approved/cleared.

Background

Intervention. See previous sections.

Available evidence. The evidence base includes 17 RCTs with 493 patients for mandibular class II and 3 RCTs with 82 patients for maxillary buccal class II. The quality of the evidence for the statement was assessed according to GRADE and considered to be high/moderate. In the

systematic review underlying this recommendation (Jepsen et al., 2019), a Bayesian network meta-analysis was performed to assess which treatment modalities demonstrated the highest likelihood of success. For the outcome such as HBL the highest-ranked groups were bone replacement graft, GTR with a bone replacement graft or enamel matrix derivative.

Risk of bias. Study quality assessment identified an unclear risk of bias for the majority of the studies. There is a mix of researcher and industry-initiated studies.

Consistency. The procedures with the highest ranking for horizontal bone gain are bone-replacement graft, bone-replacement graft with resorbable membranes or enamel matrix derivative.

Clinical relevance and effect size. It cannot be extrapolated among the therapies.

Balance of benefit and harm. The benefit of regenerative therapies to promote tooth retention outweigh the adverse events which consist mainly of local wound failure.

Ethical considerations. The perception is that regenerative therapies to promote tooth retention are preferred over tooth extraction and open flap debridement.

Regulatory consideration. All the studies reported FDA or CE-approved devices.

Economic considerations. Regenerative surgery has additional costs, which appear to be justified by the added benefits (furcation improvements).

Patient preferences. Enamel matrix derivative showed less postoperative swelling and pain than non-resorbable membranes.

Applicability. Teeth presenting with favourable patient, tooth and defect related conditions.

What is the adequate management of maxillary interdental class II furcation involvement?

Evidence-based recommendation (3.14)
In maxillary interdental class II furcation involvement nonsurgical instrumentation, OFD, periodontal regeneration, root separation or root resection **may be considered**.
Supporting literature (Dommisch et al., 2020; Huynh-Ba et al., 2009; Jepsen, Eberhard, Herrera, & Needleman, 2002)
Quality of evidence: 6 observational studies (633 patients) with low quality of evidence for non-regenerative approaches and two systematic reviews with low quality of evidence for regenerative treatment.
Grade of recommendation Grade 0 - ↔

Strength of consensus Consensus (4.3% of the group abstained due to potential CoI)

Background

Intervention. See previous sections.

Available evidence. 6 observational studies with 633 patients (class II interproximal).

Risk of bias. Low quality of evidence for observational studies.

Consistency. Following non-regenerative treatment of maxillary interproximal class II furcation involvement, moderate to substantial heterogeneity in the size of the effect (wide ranges of tooth survival) was observed. The reasons cannot be determined from the existing data.

Clinical relevance and effect size. Following non-regenerative treatment of maxillary interproximal class II furcation involvement reasonable survival rates were observed over 4 to 30.8 years.

Balance of benefit and harm. We did not identify data about harm directly related to procedures. Regarding tooth survival a benefit of root amputation/resection, root separation or tunnelling compared to SRP or OFD cannot be currently stated. For the individual choice of procedure, however, the clinician should consider criteria beyond class of furcation involvement (e.g. bone loss, jaw).

Economic considerations. Simulations based on the German health system have indicated that tooth retention after complex periodontal therapy of teeth with furcation involvement is more cost-effective than their extraction and replacement with an implant supported fixed partial denture (Schwendicke et al., 2014). A study assessing the actual cost of retention of molars in the same health system showed that cost for retaining periodontally compromised molars were minimal (Schwendicke et al., 2016).

Patient preferences. There is a strong patient preference for tooth retention (IQWiG, 2016).

Applicability. The guideline can be applied since it is independent of availability of materials and a segment of the dental workforce has been trained or can be trained to deliver surgical furcation treatment in the different European health systems.

What is the adequate management of maxillary class III furcation involvement?

Evidence-based recommendation (3.15)
In maxillary class III and multiple class II furcation involvement in the same tooth

nonsurgical instrumentation, OFD, tunneling, root separation or root resection **may be considered**.
Supporting literature (Dommisch et al., 2020)
Quality of evidence: 6 observational studies (633 patients) with low quality of evidence.
Grade of recommendation Grade 0 - ↔
Strength of consensus Strong consensus (0% of the group abstained due to potential CoI)

Background

Intervention. See previous sections.

Available evidence. Six observational studies with 633 patients.

Risk of bias. Low quality of evidence for observational studies.

Consistency. Following treatment of maxillary class III furcation involvement, moderate to substantial heterogeneity in the size of the effect (wide ranges of tooth survival) was observed. The reasons cannot be determined from the existing data.

Clinical relevance and effect size. Following treatment of maxillary class III furcation involvement, reasonable survival rates were observed over 4 to 30.8 years.

Balance of benefit and harm. We did not identify data about harm directly related to procedures. Regarding tooth survival a benefit of root amputation/resection, root separation or tunnelling compared to SRP or OFD cannot be currently stated. For the individual choice of procedure, however, the clinician should consider criteria beyond class of furcation involvement (e.g. bone loss, jaw).

Economic considerations. Simulations based on the German health system have indicated that tooth retention after complex periodontal therapy of teeth with furcation involvement is more cost-effective than their extraction and replacement with an implant supported fixed partial denture (Schwendicke et al., 2014). A study assessing the actual cost of retention of molars in the same health system showed that cost for retaining periodontally compromised molars were minimal (Schwendicke et al., 2016).

Patient preferences. There is a strong patient preference for tooth retention (IQWiG, 2016).

Applicability. The guideline can be applied since it is independent of availability of materials and a segment of the dental workforce has been trained or can be trained to deliver resective treatment in the different European health systems.

What is the adequate management of mandibular class III furcation involvement?

Evidence-based recommendation (3.16)
In mandibular class III and multiple class II furcation involvement in the same tooth nonsurgical instrumentation, OFD, tunneling, root separation or root resection **may be considered**.
Supporting literature (Dommisch et al., 2020)
Quality of evidence: 7 observational studies (665 patients) with low quality of evidence.
Grade of recommendation Grade 0 - ↔
Strength of consensus Unanimous consensus (0% of the group abstained due to potential CoI)

Background

Intervention. See previous sections.

Available evidence. Seven observational studies with 665 patients (maxillary class III).

Risk of bias. Low quality of evidence for observational studies.

Consistency. Following treatment mandibular class III furcation involvement, moderate to substantial heterogeneity in the size of the effect (wide ranges of tooth survival) was observed. The reasons cannot be determined from the existing data.

Clinical relevance and effect size. Following treatment of mandibular class III furcation involvement, reasonable survival rates were observed over 4 to 30.8 years.

Balance of benefit and harm. We did not identify data about harm directly related to procedures. Regarding tooth survival a benefit of root amputation/resection, root separation or tunnelling compared to SRP or OFD cannot be currently stated. For the individual choice of procedure, however, the clinician should consider criteria beyond class of furcation involvement (e.g. bone loss, jaw).

Economic considerations. Simulations based on the German health system have indicated that tooth retention after complex periodontal therapy of teeth with furcation involvement is more cost-effective than their extraction and replacement with an implant supported fixed partial denture

(Schwendicke et al., 2014). A study assessing the actual cost of retention of molars in the same health system showed that cost for retaining periodontally compromised molars were minimal (Schwendicke et al., 2016).

Patient preferences. There is a strong patient preference for tooth retention (IQWiG, 2016).

Applicability. The guideline can be applied since it is independent of availability of materials and a segment of the dental workforce has been trained or can be trained to deliver resective treatment in the different European health systems.

Clinical recommendations: Supportive Periodontal Care

Following completion of active periodontal therapy, successfully treated periodontitis patients may fall in one of two diagnostic categories: periodontitis patients with a reduced but healthy periodontium or periodontitis patients with gingival inflammation (Caton et al., 2018; Chapple et al., 2018). These subjects remain at high risk for periodontitis recurrence/progression and require specifically designed supportive periodontal care (SPC), consisting on a combination of preventive and therapeutic interventions rendered at different intervals which should including: appraisal and on monitoring of systemic and periodontal health, reinforcement of oral hygiene instructions, patient motivation towards continuous risk factor control, professional mechanical plaque removal (PMPR) and localized subgingival instrumentation at residual pockets. The professional interventions, also frequently referred as periodontal maintenance or supportive periodontal therapy, will require a structured recall system with visits customized to the patient needs, usually requiring 45-60-minute appointments. SPC also includes individual behaviours, since patients in SPC should be compliant with the recommended oral hygiene regimens and healthy lifestyles.

Supportive Periodontal Care: preliminary considerations

At what intervals should supportive periodontal care visits be scheduled?

Expert consensus-based recommendation (4.1)
We **recommend** that supportive periodontal care visits should be scheduled at intervals of 3 to a maximum of 12 months, and ought to be tailored according to patient´s risk profile and periodontal conditions after active therapy.
Supporting literature (Polak et al., 2020; Ramseier et al., 2019; Sanz et al., 2015; Trombelli et al., 2020; Trombelli et al., 2015)
Grade of recommendation Grade A – ↑↑
Strength of consensus Strong consensus (0% of the group abstained due to potential CoI)

Background

Intervention. Although not addressed directly in the systematic reviews underlying this guideline, different evidence supports the concept of defined intervals to perform SPC visit every 3-4 months are recommended in studies selected by (Trombelli et al., 2020).

- SPC every 3 months may be sufficient to control periodontitis progression after periodontal surgery (Polak et al., 2020).
- In addition, the conclusions of the 2014 European Workshop on Prevention, based on the review by Trombelli et al. (Trombelli et al., 2015), concluded that the recommended interval ranges 2-4 times per year, and that it could be optimized if it is tailored according to patient´s risk (Sanz et al., 2015).
- A recent study (Ramseier et al., 2019), over 883 patients, reflected on the importance of SPC and the factors involved in its success.

Is adherence to supportive periodontal care important?

Expert consensus-based recommendation (4.2)
We recommend that adherence to supportive periodontal care should be strongly promoted, since it is crucial for long-term periodontal stability and potential further improvements in periodontal status.
***Supporting* literature** (Costa et al., 2014; Sanz et al., 2015; Trombelli et al., 2015)
Grade of recommendation Grade A – ↑↑
Strength of consensus Unanimous consensus (0% of the group abstained due to potential CoI)

Background

Intervention. Although not addressed directly in the systematic reviews underlying this guideline, different evidence supports the importance of complying with SPC visit, in which PMPR is performed:

- Greater rates of tooth loss and disease progression in patients with irregular compliance, versus patients with regular compliance (Costa et al., 2014).
- The conclusions of the 2014 European Workshop on Prevention, based on the review by Trombelli et al. (Trombelli et al., 2015), concluded that compliance with the preventive