

On Factors Influencing the Clinical Outcome in Orthognathic Surgery

Akademisk avhandling

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Avhandlingen baseras på följande delarbeten:

- I. Widar F, Kashani H, Kanagaraja S, Dahlin C, Rasmusson L. A retrospective evaluation of iatrogenic dental root damage with predrilled versus drill-free bone anchor screws for intermaxillary fixation. *Dent Traumatol* 2012 Apr;28(2):127-31.
- II. Widar F, Kashani H, Alsén B, Dahlin C, Rasmusson L. The effects of steroids in preventing facial oedema, pain and neurosensory disturbances after bilateral sagittal split osteotomy: a randomized controlled trial. *Int J Oral Maxillofac Surg* 2015 Feb;44(2):252-8.
- III. Widar F, Afshari M, Rasmusson L, Dahlin C, Kashani H. Incidence and risk factors predisposing plate removal following orthognathic surgery. *Journal Craniomaxillofac Surg* 2014, SUBMITTED.
- IV. Widar F, Sköldstam J, Creutz J, Kashani H, Dahlin C. Effects of total intravenous anaesthesia versus balanced inhalation anaesthesia on haemodynamics and recovery in orthognathic surgery. *Journal Craniomaxillofac Surg* 2015, SUBMITTED.



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ABSTRACT

Background. Orthognathic surgery means surgical correction of dentofacial and congenital deformities, which includes unsatisfactory facial aesthetics, malpositioned teeth, jaw malformations and masticatory dysfunction. Correction of these conditions requires a multidisciplinary approach with a combination of orthodontics and surgery. Successful outcome of orthognathic treatment requires pre-, intra- and postoperative considerations with a multimodal approach in order to minimize morbidity and enhance recovery after surgery. Developments within the orthognathic field should focus on multimodal approaches with combined effects of modern anaesthetic protocols, minimal invasive surgery and pharmacological modification of inflammatory responses. However, surgical morbidity after orthognathic surgery is still associated with undesirable sequelae such as damage to teeth, facial oedema, pain, neurosensory disturbances, prolonged recovery time and removal of titanium plates.

Intraoperative anchorage of the occlusion is a major keystone in the implementation of the orthognathic planning during surgery. Bone anchor screws are therefore occasionally required in transalveolar positions as reinforced rigid emergency anchor for proper intermaxillary fixation in cases when orthodontic appliances loosen or when preoperative orthodontic treatment isn't indicated. Furthermore, steroids are recommended to reduce swelling, pain, nausea and vomiting (PONV) and may promote nerve healing after surgery. The multimodal effects of steroids need further investigation, thus the optimal dosages and the timing of administration is of great interest. Moreover, removal of inserted titanium fixation plates after surgery occur due to plate related complications. The reason for plate removal needs further investigation. Finally, different general anaesthetic protocols influence haemodynamics and subsequently postoperative pain, recovery and hospitalization. Evaluation of these protocols is needed to understand the recovery process and to promote mobilization of the patient after surgery.

Objectives. The aim of the first study was to evaluate two types of surgical approaches for insertion of bone anchor screws for intermaxillary fixation, regarding frequency of iatrogenic dental root injuries. The second trial investigated the efficacy of single versus repeated betamethasone doses on facial oedema, pain and neurosensory disturbances after bilateral sagittal split osteotomy (BSSO). The main objective of the third study was to investigate the incidence and reasons for removal of titanium fixation plates following orthognathic surgery, identify risk factors predisposing removal and to explore if the patients discomfort was reduced after removal. The primary objective of the fourth study was to evaluate haemodynamics and recovery parameters in relation to two general anaesthetic protocols; remifentanyl-propofol based total intravenous anaesthesia (TIVA) versus fentanyl-sevoflurane based balanced inhalation anaesthesia (BA) in orthognathic surgery. The second objective was to evaluate long duration local anaesthesia on recovery parameters and hospitalization.

Material & Methods. Study I: Two surgical methods for insertion of bone anchor screws for intermaxillary fixation were compared retrospectively (n=123). Study II: Two study groups and a control group were compared with a randomized controlled trial (RCT) in order to evaluate the effect of steroids. This was performed with repeated doses (4+8+4 mg betamethasone, n=14), a single dose (16 mg betamethasone, n=11) and controls (n=12). Study III: Medical records were retrospectively reviewed (n=404) and an additional questionnaire was used to evaluate fixation plate related complications. Totally 323 (80%) patients responded the questionnaire and were subsequently included in the study. Study IV: Anaesthetic curves and medical records were retrospectively reviewed for the comparison of two anaesthetic protocols (n=269). Ninety-four patients were audited due to strict inclusion criteria.

Results. The first study revealed that the twist drill was hazardous in transalveolar positions since it could cause iatrogenic dental root injuries ($p<0.001$). The second study showed that steroids inhibited progression of facial oedema the first day after surgery ($p=0.017$). However, steroids did not reduce neurosensory disturbances over time. Reduced bleeding was associated with improved pain recovery over time ($p=0.043$). Patients requiring higher dosages of analgesics due to pain had significantly delayed recovery regarding neurosensory disturbances ($p<0.001$). The third study revealed that smoking, osteotomies performed in the mandible and additional number of inserted fixation plates resulted in more plate removal. A majority of the patients were relieved from plate related complications after plate removal. In the fourth study no significant differences between the two anaesthetic protocols were found regarding: blood loss, operating time, recovery time, postoperative nausea and vomiting (PONV) and hospitalization. Remifentanyl-propofol based TIVA facilitated haemodynamic stability. Long duration local anaesthetics (ropivacaine 7.5 mg/ml) administered at the end of surgery appears to improve mobilization of the patient and reduce hospitalization.

Conclusions. Morbidity was reduced when the twist drill was avoided prior the insertion of bone anchor screws in transalveolar positions. Steroids reduced facial oedema. The need for fixation plate removal was reduced when the numbers of inserted plates were minimized and smoking arrest was emphasized. Recovery from pain was enhanced when blood loss was minimized.

Key words. Intermaxillary fixation, iatrogenic root damage, osteotomy, sagittal split ramus, steroid, hypoesthesia, inferior alveolar nerve, risk factors, smoking, mandible, orthognathic surgery, anaesthesia, haemodynamic, remifentanyl, ropivacaine, recovery.

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