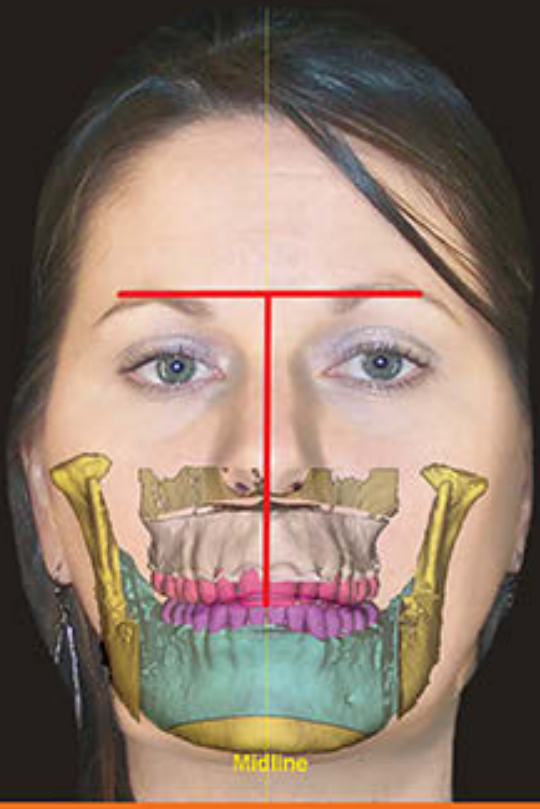
FUNDAMENTALS OF ORTHOGNATHIC SURGERY AND NON SURGICAL FACIAL AESTHETICS

Third Edition



Malcolm Harris
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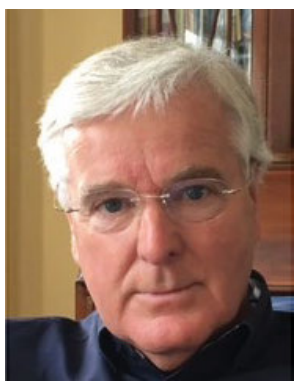

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Preface and Acknowledgements

The first edition of the "Fundamentals" was published in 1991 by Malcolm Harris and Ian Reynolds shortly after Ian's untimely death and is now coedited for the second time by Nigel Hunt. This 3rd Edition of the "Fundamentals of Orthognathic Surgery has been substantially extended with completely new chapters covering Non Surgical Facial Aesthetics by Rui Ming Ho and Fooi Chin Ng and the application of Cone Beam Computer Scanning for Surgical Planning which was created by Paul Thomas and Sabah Kalamchi with the advice of Tarik Kramcha, a Biomedical Engineer of Healthcare 3D Systems. Although Computer Assisted Surgical Simulation (CASS) may supersede the traditional multi-stage manual orthognathic planning process, this means of record transfer by Mohammad Anwar Bamber and Ed Payne has been retained as an essential clinical skill.

Both fresh disciplines have made the "Fundamentals" an up-to-date operative manual for surgical and orthodontic consultants, their trainees as well as theatre and ward staff.

The important major deformity sections are still the Secondary Management of Clefts by Peter Ayliffe and Tom Walker, the Role of Distraction Osteogenesis by Kieran Coghlan, Rhinoplasty by Santdeep Paun and Temporomandibular Joint Ankylosis*. The

invaluable knowledge of nutrition for the Maxillofacial Surgery patient is by Tara Brantley and Sabah Kalamchi. Susan Cunningham has refined her essential chapter "The Psychosocial Aspects of Facial Deformity" to reconfirm the crucial borderland between the psyche and cosmesis, and warn how the unstable patient can create unexpected problems for the clinician.

The chapter on Emergencies and Complications has been modernised by Dan Harris, and Gemma Harris provided the digital rescue service. The illustration for the cover was produced by Paul Thomas. Many of the drawings from the original text have been retained and were by Mohamed Nour Awang, David Banks, Helen McParland, Daljit S. Gill and Cristina Nacher. There are no references as very few clinicians consult an ever changing scene which is readily available through Google Chrome or Pubmed etc.

Nigel and I must express our gratitude for the continued patience and inspiration of our wives Susan and Naomi and are also grateful to Joy Quek of World Scientific Press for her generous support.

With our best regards to all readers, Malcolm Harris* and Nigel Hunt.

Contents

Chapter 1

General Assessment

Malcolm Harris and Nigel Hunt

Introduction

The overall management of a patient with facial deformity requiring orthognathic surgery is both an art and a science. The management must be based on a team approach. Whilst the team may vary according to local circumstances, the optimum would consist of an orthodontist, an oral and maxillofacial surgeon, a liaison psychiatrist or clinical psychologist, a specialist in restorative dentistry, supported by a maxillofacial technician. A speech therapist is essential for cleft cases and plastic surgery expertise should also be available on an individual patient basis. Whilst a patient may be referred to any of the above specialists, it is important that all patients follow an agreed care pathway to ensure patient satisfaction with the outcome. It is imperative that as part of the initial consultation, patients are encouraged to state precisely what aspects of their facial features or dentition they would like corrected, for what reason and the length of time that they have sought treatment. Whilst the patient can be guided to what constitutes an ideal facial appearance, it is vital that the clinician does not lose sight of the patient's underlying concerns.

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The motivation behind the request for treatment is very important and special consideration is required when psychological factors appear to influence both the diagnosis and the treatment.

The combined orthodontic and surgical treatment goals are:

- Improve facial aesthetics
- Improve dental aesthetics
- A functional, balanced and stable occlusion
- A satisfied patient.

The management protocol for facial deformity should comprise the:

- History
- Clinical examination
- Investigations
- Initial diagnosis
- Treatment plan
- Presurgical orthodontics
- Final treatment plan
- Surgery
- Postsurgical orthodontics
- When appropriate, restorative dentistry, psychological intervention or support and speech therapy will be required.

History

The purpose of the history is to identify the patient's orofacial problems and their cause. This may be a family trait, congenital deformity, or the result of trauma in infancy or adolescence. It is useful to ask the patient to draw up a problem list in order of priority of the specific features they wish to have corrected and for the clinician to note where the drive for treatment has arisen. For example, a patient may complain of having a prominent chin, which they have noticed ever since adolescence and for which they have frequently requested

treatment through the general dental practitioner. This differs from the sudden desire to change minimal deformity as a response to a personal crisis. The long term success in terms of patient satisfaction is far better when driven by the patient than that of a patient seeking surgery driven by a parent, partner or close relative. Many orthognathic procedures have a secondary effect on other aspects of facial appearance. For example, correction of a "gummy smile" with a maxillary impaction will also increase the fullness of the cheeks over the malar region and widen the alar width of the nose It is important to inform the patient of these changes. The overall treatment goals must be to improve facial and dental aesthetics, and to provide a functional and stable occlusion but with the underlying premise that these satisfy the patient's reasonable wishes.

The Medical History

Most orthognathic patients are young and fit to undergo a general anaesthetic and prolonged surgery. Occasional disorders, which require specific attention include:

i) haemophilia or similar clotting disorders which require pre- and intraoperative correction
ii) acromegaly patients may be a cardiomyopathy risk
iii) antibiotic or analgesic idiosyncrasy or allergy
iv) rheumatic or congenital heart valve lesions
v) obstructive sleep apnoea should warrant a sleep study and specific assessment.

Body Dysmorphic Disorder (*Formerly Dysmorphophobia*)

A small but significant proportion of patients may present with varying degrees of concern about one or more aspects of their facial appearance without appropriate clinical signs. This may be a manifestation of the psychiatric disturbance now called the Body Dysmorphic Disorder (formerly dysmorphophobia). This condition

will create problems in surgical management as the patient is often dissatisfied with the final result. The condition invariably raises the conflict as to whether one does,

i) what the patient wants
ii) what the patient needs
iii) or nothing.

It is therefore worth consideration in some detail. See Chapter 16.

Evaluation of the Patient

Patient Evaluation

- Clinical examination
- Radiographic examination and if necessary a Cone Beam Computer Tomographic (CBCT) scan
- Analysis of study models
- Psychological examination where appropriate.

Introduction

The full examination must include the basic scrutiny of the patient, radiographs, cephalometry and study casts. The evaluation should begin with a systematic examination of the patient's facial features from the frontal perspective (vertical proportions) and the lateral profile (horizontal relations). It is important to consider the vertical facial proportions and their balance in relation to the patient's general build, and personality. Examples of patients who may not need surgery are: (i) a young female patient who possesses a vivacious and extrovert personality suited to a mild Class II malocclusion accompanied by a broad smile and marked incisor exposure and (ii) similarly, a well-built male may be suited to a mild Class III malocclusion with a minor degree of mandibular prognathism. It is also important to take

into consideration the overall facial shape, as there is extreme variation from a square shaped facial appearance to one of a long ovoid appearance. In the former case this may fit in well with a shorter stature whereas a longer face may be more suited to a tall individual. At the moment these decisions are based on experience and intuition.

Clinical Examination

The clinical examination should be undertaken with the patient comfortably seated with the Frankfort plane horizontal. Not only is it easy to visualise a line running from the inferior orbital margin to the upper end of the tragal cartilage, but this can be readily compared with the same horizontal plane on the lateral skull radiograph (cephalogram) and photographs.

Frontal Assessment

There are several important facial features to note. These include:

a) *The facial proportions*
   The useful classic guide is to consider the face as having three equal vertical components (Figure 1.1): The distance from the hairline to the soft tissue bridge of the nose; from the soft tissue bridge of the nose to the alar base and from the alar base to the lower border of the chin. It is also important to determine whether or not there is a relative excess or deficiency in the vertical height of either the maxillary or mandibular thirds.
b) *The alar base width*
   Traditionally in a westernised population it is accepted that the alar base width, as measured from the lateral aspects of the alar cartilages of the nose, should be approximately equal to the distance between the inner canthi of the eyes (Figure 1.2). This measurement has importance when planning a maxillary impaction.

Figure 1.1 The superficial aesthetic proportions of the face can be divided into equal thirds. However the underlying cephalometric proportions of the upper to the lower facial height are 45:55 (see Figure 2.3).

Figure 1.2 The alar base width should approximate the inner intercanthal distance.

c) *Incisor exposure* (*the lip — incisor relationship*)
For a patient with an average upper lip length of 20–25 mm, the standard exposure for orthognathic planning of the upper labial segment with the lips parted at rest should be 2–4 mm of the incisor crown. On smiling, the exposure should increase to the level of the gingival margin of the upper labial segment. This assessment is crucial when planning the vertical height of the mid face where the amount of incisor exposure should be inversely proportional to the length of the upper lip (Figure 1.3). Where the upper lip length is very short then the patient would expect to show more of the upper incisors. Any attempt to reduce the incisor exposure in relation to a short upper lip will lead to an unaesthetic reduced middle face height. Similarly, with a long upper lip, the patient would be expected to show less or no upper incisor, both at rest and during facial animation. The lip incisor measurement should be undertaken with the face at rest. Animation especially smiling will enhance the face and make planning difficult.

The harmony between the components of the lower third of the face is also important, in that the subnasale to the upper lip vermillion border should be a third of the total (i.e. half of the lower lip vermillion border to the soft tissue menton). In those cases where the lower third of the face appears overclosed, it is wise to re-evaluate both the upper lip length and the incisor exposure with the mouth open so that the lips are taken just out of contact.

d) *Facial asymmetry and centre line relationships*
It is important to note any asymmetry of the middle or lower third of the face, including the position and levels of the eyes. This may be facilitated by marking the midlines on the patient's face and also by analysing a clinical photograph or surface laser scan.

The patient's maxillary and mandibular dental midlines may not be coincident nor match their skeletal midlines (Figure 1.4).

Figure 1.3 With an average upper lip length, a useful aesthetic proportion is **(a)** 2–4 mms of maxillary incisor crown visible with the lips apart at rest. **(b)** This increases to the level of the gingival margin on smiling. **(c)** Here the excess incisor exposure of vertical maxillary excess at rest is important for the estimation of the required vertical impaction. **(d)** The aesthetic animated face makes this estimation difficult.

Generally where the maxillary dental midline is displaced to one side of the skeletal midline, there is an indication for orthodontic correction rather than attempting to rotate the maxilla in order to produce a dental midline coincident with the midface. Where a mandibular dental midline discrepancy is noted in

Figure 1.4 **(a)** The facial asymmetry of a left-sided hemimandibular elongation with the chin point displaced to the right. The lower dental midline mirrors the mandibular skeletal asymmetry and will be corrected as part of the surgery. **(b)** The maxillary dental midline is displaced to the left of a symmetrical maxilla and therefore should be corrected as part of the orthodontic preparation of the case. **(c)** Postural camouflage showing tilting of the head to level the lip line, in an asymmetrical face can give a false impression of orbital dystopia. **(d)** Levelling the occlusal plane with bimaxillary osteotomies also "levels" the eyes!

relation to the upper midline, it is important to determine whether it is coincident with a mandibular skeletal asymmetry or of purely dental origin. Where the skeletal asymmetry and dental midlines coincide the centre lines will be corrected as part of the surgical procedure.

Postural camouflage can be a problem with the asymmetrical face as shown in Figures 1.4c and 1.4d. This patient with a marked occlusal cant habitually tilted her head to level the lip line which gave the impression of orbital dystopia. This was corrected by bimaxillary levelling of the occlusal plane.

Profile Assessment

As with frontal evaluation it is important to work down the profile from above to observe key features.

a) *Relative protrusion of the maxilla and mandible*
The relations of the maxilla and mandible to each other and to the skull base will be discussed in greater detail in Chapter 2. It is common for patients to complain of a protruding chin, whereas it is the relationship of the maxilla to the skull base which is at fault, i.e. a hypoplastic maxilla related to a normal mandible. This can be clinically demonstrated by simply padding out the upper lip with soft wax or cotton wool (Figure 1.5) until the lip relationship and facial profile appear normal. Similarly, the surgical correction of a retrognathic mandible may be visualised by asking the patient to slide the mandible forwards (Figure 1.6). Most orthognathic cases require a combination of both maxillary and mandibular surgery and an assessment of the protrusion of the mid third and mandible can be made by assessing their position relative to the coronal facial plane which divides the head into dorsal and ventral (posterior and anterior) portions and passes downwards through the nasion (Figure 1.8). With normal facial proportions the soft tissue profile of the maxilla should be approximately 2–3 mm in front, and the soft tissue pogonion should lie 2 mm behind this facial plane (Figure 1.7). However the face will vary with ethnic norms, giving anterognathic, mesognathic or posterognathic profiles (Figure 1.8b).