

Functional bite registration

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Objectives

Explain the process of recording a functional bite

Understand the rationale behind functional bite registration

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Functional appliances

- Functional appliances are a group of largely removable appliances originally developed in Europe during the late nineteenth and early twentieth century.
- The majority are designed to correct class II malocclusion, primarily by forward posturing of the mandible in a growing child.
- The term functional jaw orthopaedics was coined for treatment with these types of appliances, which reflected the treatment philosophy underlying their use by
- Changing the functional environment of the dentition, structural adaptation of the orofacial tissues would follow, with an enhancement of growth potential allowing for treatment of sagittal skeletal discrepancies between the jaws.

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Theories on how functional appliances work

- Functional appliances eliminate a sagittal jaw discrepancy by posturing the mandible forward. This postural correction is fundamental to the appliances' mode of action and influences four principle regions:
- Orofacial soft tissues;
- Muscles of mastication;
- Dentition and occlusion; and
- Jaw skeleton.

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Clinical effects of functional appliances

- Numerous types and designs of functional appliance have been described, each with its own treatment philosophy. In essence, all of these appliances have similar effects, with the most significant being dentoalveolar change:
- Retroclination of maxillary incisors;
- Proclination of mandibular incisors;
- Distal tipping of the maxillary dentition;
- Mesial eruption of the mandibular buccal dentition;
- Restraint of forward maxillary development; and
- Forward movement of the mandible due to small additional growth at the condyle and remodelling of the glenoid fossa.
- Combined, these effects will result in the correction of a class II dental occlusion, an increase in lower face height and a clockwise rotation of the mandible

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Types of functional appliance

- Activators
- Activators form a group of loosely fitting appliances that come in a single piece or monobloc. They posture the mandible forwards by lingual extension of the acrylic monobloc.
- Types:
 - Andresen activator
 - Woodside/Harvold activator
 - Bionator
 - Medium Opening activator



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Frankel system

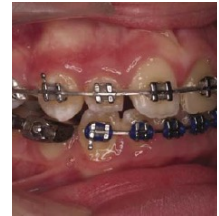
- A series of removable functional appliances or functional regulators were developed by Rolf Frankel in what was the German Democratic Republic (Frankel, 1980).
- Frankel was an advocate of the functional matrix theory of growth, which states that there is no direct genetic influence on the size, shape or position of the skeletal tissues.
- Rather, bony growth is driven by form and function of the surrounding soft tissues.
- Frankel appliances are designed to change the muscular and soft tissue environment of the jaws and therefore modify growth



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Herbst appliance

- The Herbst appliance is unusual in being a fixed functional appliance cemented or bonded directly to the dentition.
- Protrusion of the mandible is achieved via a bilateral telescope apparatus attached to maxillary first molar and mandibular first premolar bands.
- The telescopic arms consist of a tube, plunger and pivot, which allows for opening and some lateral excursion, with these arms advancing the mandible so that the incisors are edge to edge.



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Twin block

- William Clark originally described the twin block appliance, which is unusual in consisting of separate upper and lower removable appliances that work in unison (Clark, 1988).
- Each appliance incorporates a set of bite blocks that in occlusion posture the mandible forwards. The inclined planes of these blocks are set at approximately 70 degrees with the height greater than 5-mm vertically to ensure that the patient occludes with the lower block in front of the upper and not on it.
- Overjet reduction can be rapid with a twin block and accompanying changes in the vertical dimension usually do not occur at the same rate, so a lateral open bite is often present at the end of overjet reduction, particularly where the overbite was originally increased



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Clinical use of functional appliances

- The ideal case for treatment with a functional appliance should have the following clinical features:
- Increased overjet and class II buccal segment relationship;
- Mild to moderate skeletal class II base;
- Average to reduced lower face height;
- Proclined maxillary incisors;
- Retroclined mandibular incisors; and
- Active growth.

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Timing of treatment

- Functional appliances work most effectively in growing patients; however, the rate of facial and mandibular growth is not constant during childhood and adolescence and can be affected by growth spurts, particularly the pubertal growth spurt.
- The onset, duration and intensity of the mandibular pubertal growth spurt varies between individuals but generally occurs later in boys than in girls.
- Functional appliances appear to have a slightly greater effect on skeletal growth if treatment takes place during this period.

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Functional appliances

The Twin Block appliance is the most commonly used functional appliance in the UK for the treatment of skeletal II malocclusions in growing patients.

First described by William Clark (1988)

To enable ideal construction of a Twin Block appliance great care must be taken with the wax bite which records the desired jaw relationship.

It is of utmost importance to take as good a wax bite as possible, because it will have consequences not only for the accurate construction of the Twin Block appliance but also for the effectiveness or otherwise of this stage of treatment.

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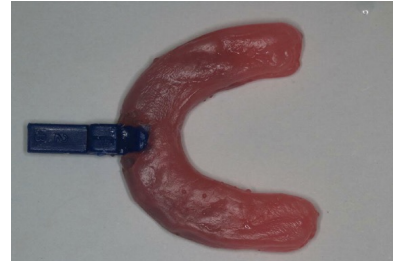
Bite registration

When the appliance is in place, it is essential that the lower block engages anterior to the upper block to maintain the forward posture of the mandible.

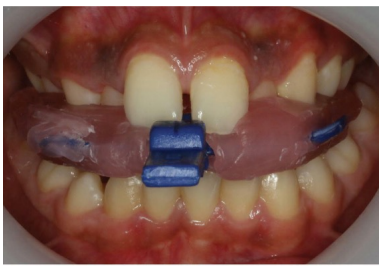
Otherwise, the mandible may be maintained in a downward rather than forward position

The latter will fail to maintain the required forward posture necessary for Class II correction but may also impair the comfort of the appliance leading to lip incompetence with the appliance in situ and ultimately poor compliance.

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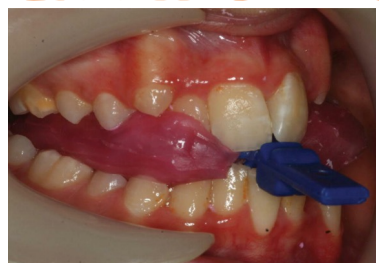
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Impressions

- Detailed impressions in alginate should be taken of both dental arches with adequate extension into the lingual and labial vestibules.
- Particularly important if a Frankel functional regulator is being prescribed, as the buccal shields and labial pads are made to actively stretch the mucosa.

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- All functional appliances posture the mandible forward.
- To achieve this, they are constructed on simple articulators with the working models mounted to a postured bite taken in the mouth.
- If the overjet is 10mm or less this will generally mean the postured bite can be taken with the incisors in an edge-to-edge relationship.
- If greater than 10mm, it is unlikely that full overjet reduction can be achieved with a single appliance.
- Reactivated or remade

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Wax registration

- 2-3mm opening anteriorly
- 6-7mm opening in the premolar region to allow adequate block height without excessive anterior opening

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Project bite

- Blue acrylic Exacto Bite Stick
- Gives laboratory technician information regarding the AP, vertical and transverse position of the postured mandible.
- Acrylic is 2mm thick anteriorly and has grooved upper and lower surfaces
- Upper incisors seat into one of the three grooves to control the amount of mandibular advancement
- Lower incisors fit into the single groove on the lower surface



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- Large anterior opening may effect eating and impair speech when the appliance is in place.
- Small opening can impair forward posture of the mandible, particularly at night, limiting the effectiveness of the forward posture

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- Alternative techniques involve a thickened block of wax moulded to the upper and lower arches
- The thickness of the wax should be 5-7mm in the premolar region.

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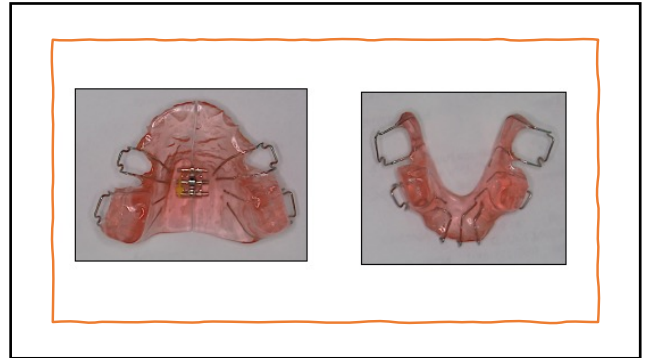
Incremental advancement v one-step advancement

- Larger initial advancement may result in greater soft tissue stretch leading to more pronounced dental changes than with gradual advancement.
- Studies would suggest that there is little difference in the relative proportion of skeletal to dento-alveolar effects with either approach.

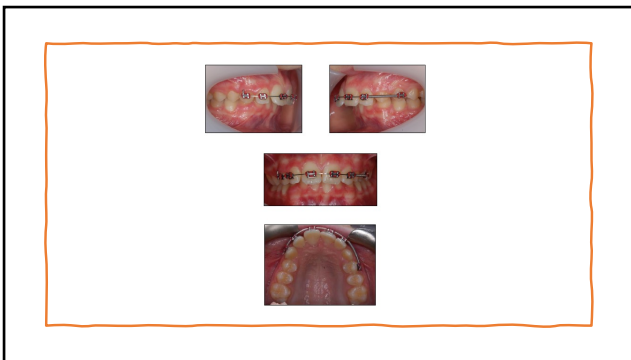
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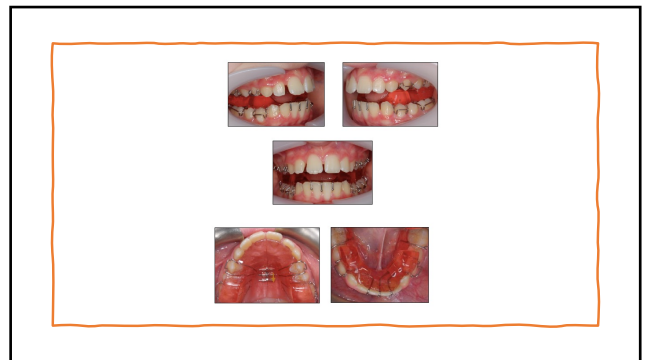
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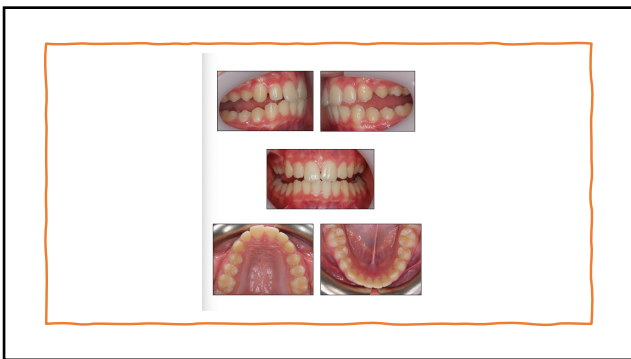
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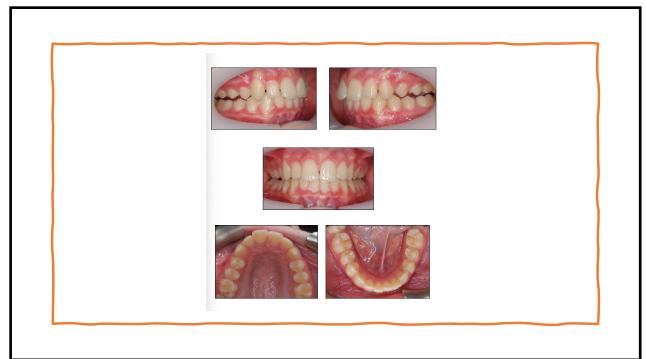
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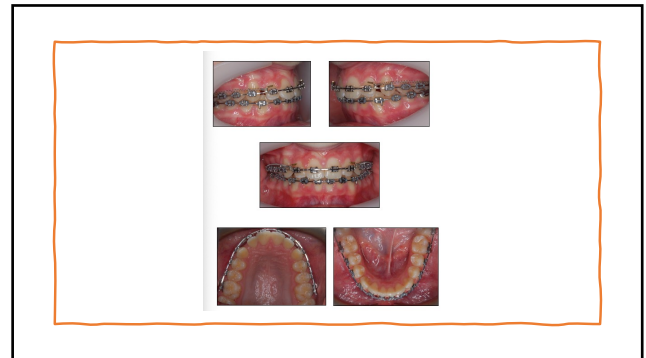
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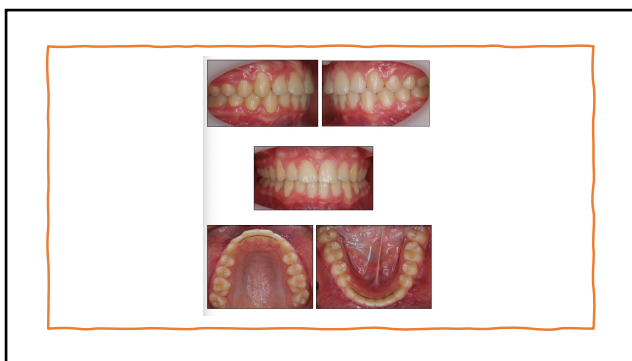
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Appliance fitting and review

- Appliances should be fitted within two weeks of the impressions being taken to ensure a good fit.
- The patient should be shown the appliance before fitting and instructed on regime.
- Advise the patient to practice inserting and removing the appliance.
- Gradual buildup of hours over several weeks to let the patient get used to wearing the appliance
- Part time/Full time wear?

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Review

- Use of a calendar to record the hours worn may improve compliance.
- The patient should be reviewed one month following appliance fitting.
- At each visit, the overjet and buccal segment relationship should be recorded. In addition, the overjet should also be recorded in maximum protrusion.

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How to tell if patient is wearing appliance as prescribed

- Normal speech
- No excess saliva
- Reduction in overjet
- Increase in reverse overjet
- Change in buccal segment (canine/molar relationship)
- Signs of wear on the appliance
- Marks on soft tissue left by appliance

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How to monitor progress?

- Record overjet at each visit
- Record reverse overjet at each visit (maximum protrusion)
- Record both canine and molar relationship

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Practical

- Record functional bite

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