Laboratory Skills

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Learning outcomes

- Describe the stages in the production of study models
- Understand the laboratory stages required for appliance production
- Explain the need for clear communication with the laboratory
- Demonstrate the ability to complete laboratory forms
- Understand IOTN and PAR

Study models

- Orthodontic study models are essential diagnostic records, which help to study the occlusion and dentition from all three dimensions.

- They are accurate plaster reproductions of the teeth and their surrounding soft tissues.

Use of study models

- Form part of a patients medical record
- Keep for 11 years or until the age of 25
- IOTN and PAR assessment

Requirements of study models

- 1. Models should accurately reproduce the teeth and their surrounding soft tissues.
- 2. Models are to be trimmed so that they are symmetrical and pleasing to the eye and so that an asymmetrical arch form can be readily recognized .
- 3. Models are to be trimmed in such a way that the dental occlusion shows by setting the models on their backs.
- 4. Models are to be trimmed such that they replicate the measurements and angles proposed for trimming them.
- 5. Models are to have clean, smooth, bubble-free surfaces with sharp angles where the cuts meet.

Uses of study models

- 1. Assess and record dental anatomy
- 2. Assess and record intercuspation
- 3. Assess and record arch form
- 4. Assess and record the curves of occlusion
- 5. Evaluate occlusion with the aid of articulators
- 6. Measure progress during treatment
- 7. Detect abnormality, e.g. localized enlargements, distortion of arch form, etc.
- 8. Calculate total space requirements/discrepancies

How to cast study models

- Check to ensure the impressions for suitable
- Free from voids and firmly attached to tray
- Clean and rinse impressions well prior to casting
- Shake off excess water

How to cast study models

- Mix plaster
- Ratio of water to plaster 35:100
- Tap plaster mix carefully into the impression avoiding trapping any air
- Build up plaster base in layers allowing each layer a little time to partially set/firm

Stage 1

- Once the plaster is set enough, carefully invert impressions onto plaster bases

Stage 2

- Using a plaster knife, carefully remove any excess plaster in the lingual region of the lower and around the periphery

Stage 3

- Once the plaster is set firm enough for you to pick up, trim away excess plaster leaving enough for the base to be suitably trimmed

Stage 4

- Check that the plaster has set and the exothermic reaction is complete

- The models will heat up as the plaster sets and cools when the process is complete

Stage 5

- Carefully remove the impression trays from the models and check for any breakages of the teeth before discarding the impressions

Stage 6

- Trim away the excess plaster around the periphery of the models

Stage 7

- Check the fit of the wax bite

Stage 8

- Trim the lower model so that the incisal edges of the incisor teeth and occlusal surfaces of the last molars are parallel to create a level occlusal plane

Stage 9

- Check the bite to determine which classification it falls into as this will affect the way in which they are trimmed

- Eg. Class III malocclusion will require a wider lower base and the upper needs to be trimmed to allow for this

Stage 10

- Taking care to ensure that the dental midline is facing directly forwards, trim the back edge of the upper model level to 90 degrees to the base

- Place the upper and lower models into occlusion with the wax bite and trim the backs level using the upper as a guide

Stage 11

- Using a slide attachment if available, trim the top surface of the upper model so that the bases are parallel.

- This is dictated by the lower and the occlusal plane trimming done previously

Stage 12

- Using a slide attachment, trim the buccal sides of the upper model to a 65 degrees angle, checking that enough space is left for the lower to be trimmed to match, especially in a Class III case

Stage 13

- Trim the labial segments to a 25 degree angle

- Do this to either side of the model making sure that the central point which is subsequently forms meets at the midline point

Stage 14

- Trim the heels of the upper to 115 degrees

Stage 15

- Place the upper and lower into occlusion and trim the lower base to match the upper

Stage 16

- If you have a smoothing wheel on the grinder, smooth the sides of the models at this stage

Stage 17

- Neaten off the edges of your models once more to flatten them off

Stage 18

- Mark the models with the patients details

Stage 19

- Place in a model dryer to dry or leave at room temperature for a minimum of 48 hours

- This will ensure that all excess water has dried off and the models will not be susceptible to mould during storage

Fabrication of a twin block appliance

- Place the upper and lower models to the supplied protrusive bite

- Soak the assembly in cool water for 15 minutes

Fabrication of a twin block appliance

- Articulate the models with the protrusive bite and mark a 7mm opening between the premolars
- Measure a 70 degrees angle for the blocks using a protractor
- Upper blocks are located from 2nd premolar to 2nd molar
- Lower blocks are located from 1st to 2nd premolar

Fabrication of a twin block appliance

- Allow the models to dry before applying a Unifol cream separator
- Highly economical mold sealer for production of high quality acrylic dentures
- Alternative to conventional cold mould seal
- Quick drying formulation of alginate and emulsified oils produces separating properties either in flask or injection curing

Fabrication of a twin block appliance

- Constrct wire components for the upper and lower models
- Attach the componets to the upper model using wax and then form a wax guard from the 5’s to 7’s
- Oracryl acrylic powder and Oracryl resin liquid the blocks are built up and the baseplaste using a salt and pper technique

Fabrication of a twin block appliance

- Cover the lower teeth with Vaseline and place upper and lower blocks back into the articulator
- Place them ina pressure pot for 10 minutes at a water temperature of 45 degrees
- Remove models from the pressure pot and melt off the wax guard with boiling water

Fabrication of a twin block appliance

- The upper appliance is now cured and ready for trimming
- Use a tungsten bur and then a smoothing bur
- Check the occlusion with articulating paper to ensure the bite is open to 7mm

Fabrication of a twin block appliance

- Repeat the process for the lower model
- Construct the components and attach them to the lower model with wax
- Place in cold water for 15 minutes

Fabrication of a twin block appliance

- Place sellotape over the upper blocks to revent the acrylic resin from sticking/bonding with them
- Apply Oracryl acrylic powder and Oracryl resin liquid using the salt and pepper technique
- Spray the lower block first and then the baseplate
- Place in the pressure pot for 10 minutes at 45 degrees to cure

Fabrication of a twin block appliance

- Melt off the wax with boiling water and follow the same procdure for the upper block by preparing to trim the lower cured appliance
- Check the occlusion of both blocks against each other
- The lower block is now trimmed and ready to pumice and polish

Fabrication of a twin block appliance

- Upper and lower appliances are finished with a careful pumice and polish

- Place onto articulator and check

Fabrication of a twin block appliance

- Finished models returned to the clinician

Laboratory form

- 4 components required for a removable appliance

- ARAB

- **A**ctive
- **R**etention
- **A**nchorage
- **B**aseplate

Components

- Active: springs/screws
- Retention: Adams clasp, Southend clasp
- Anchorage: Mucosal coverage/teeth
- Baseplate: Acrylic biteplane

Digital workflows

- Intraoral scanning
- Captures accurate representations of the teeth and occlusion
- Creates digital 3D models
- Improve the patient experience by replacing traditional alginate impressions with intra-oral scans

3D printing

- Digital study models
- Removable appliances
- Aligners
- Retainers

Pre and predicted post treatment outcome

Questions?