VET3D
PO Box 6476
CV6 9LZ
01676 534927
bill@vet3d.co.uk
www.vet3d.co.uk

SOP – vertebral drill guides

Please read these notes carefully and contact us immediately if you require any further information or have any concerns regarding the printed models or guides supplied.

Pre-operative

- In most cases vertebral models and drill guides will be supplied.
    - Vertebrae (usually including planned screw pilot holes) - translucent yellow plastic – for pre-op / intra-op practice of drill guide fit and intra-op measurement of required screw lengths and trajectories – these can be autoclaved (see guidelines below).
    - Drill guide or guides – biocompatible and autoclavable translucent orange plastic. Recommend autoclave protocols are below, however all standard protocols are acceptable.
        - 138°C for 3 minutes
        - 134°C for 6 minutes
        - 121°C for 15 minutes
- The 3D vertebral models, and especially the drill guides, are UV light sensitive and should be stored away from direct sunlight (e.g. in a draw or box). Extended exposure to UV light may reduce the strength of the guides.

Intra-operative

- A standard surgical approach to the affected vertebrae is made.
    - It is unusual that the normal approach requires modification.
- Ensure soft tissue elevation is sufficient for the drill guide footprint.
    - In most cases muscle elevation is continued slightly more laterally than may be familiar –
        - Cervical – muscle elevation extends to the bases of the transverse processes; at C6 this is exposed axially.
        - Cranial thoracic – the mamillary / transverse processes are usually exposed dorsally.
        - Caudal thoracic / lumbar – the articular facets are usually exposed.
    - Due to potentially narrow margins for error during the placement of vertebral pedicle screws it is essential that guide fit onto the vertebral cortex be optimised. For this reason all adherent soft tissue within the area of the guide footprint should be removed – scraping with the flat edge of a number 15 scalpel blade is recommended.
    - It is sometimes necessary to partially resect a dorsal spinous process to permit guide placement – this will be discussed at the planning stage if required.
- Identify the position of drill guide fit.
    - This is usually obvious due to highly contoured nature of most vertebrae.
    - Some vertebrae have less well-defined contours available for guide fit and require extra care during guide positioning – these include C7 and especially C1.
- Drill the pilot holes.
    - Carefully align the drill bit with the channel in the guide such that off-axis pressure (which could move the guide) is avoided. The transparent, cylindrical nature of the channel facilitates alignment.
    - The guide is stabilised by the non-dominant hand or an assistant – typically with gentle downwards pressure.
    - To maximise accuracy, the tolerance between the drill bit and guide channel is relatively tight – a small amount of sterile lubricating jelly applied to the drill bit can facilitate alignment within the guide channel.
    - Drill the first pilot hole – in most cases two distinct cortices can be appreciated during drilling.
    - After the *trans*-cortex has been drilled in most cases the drill bit is detached from the chuck and left in position, thus stabilising the guide whilst additional pilot holes are drilled.
    - This process is repeated for each vertebra to be stabilised.
- Perform additional procedures.
    - Should additional procedures such as laminectomy or ventral slot be required these are generally optimally performed following pilot hole drilling (to maximise available cortex for guide fit) but before screw placement (which tend to get in the way).

- Place the screws.
    - Self-tapping locking screws are recommended due to their relatively high core diameter.
    - The appropriate screw length can be measured with a depth gauge on the drilled vertebra or the 3D-printed vertebral model (the latter approach can be done in advance by an assistant).
    - It is important that the screw is carefully aligned with the pilot hole at initial engagement to minimise the risk of the screw tapping a path different to the pilot hole. This is a rare but potentially serious event which is more likely with smaller screws and in soft bone. The trajectory of the pilot hole can be checked with a depth gauge in the drilled vertebra and also in the 3D-printed model.
    - The screws are left long for PMMA bonding – the exact protruding length depends on patient size and surgeon preference, but is usually between 10mm and 16mm.
- PMMA placement.
    - PMMA is moulded around the protruding screw shafts and heads to bond these together.
    - Any point of entry into the vertebral canal is carefully protected to prevent PMMA intrusion.
    - Bone wax can be placed in the screwdriver recesses on the screw heads to facilitate later screw removal should that be required.
    - Copious lavage is recommended to minimise local tissue injury during the exothermic curing process.

Post-operative

- We actively encourage feedback regarding any aspect of the guide system – please let us know your thoughts.