




INTRAOPERATIVE SPINAL NAVIGATION USING BRAINLAB NAVIGATION MACHINE	
Version Number:	V1
Date of Issue:	March 2020
Reference Number:	ISNUBNM-03-2020-BMcK-ST-V1
Review Interval:	3 yearly
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Document Review History		
Review Date	Reviewed By	Signature
2023		

Document Change History	
Change to Document	Reason for Change

Children's Health Ireland at Crumlin		 Children's Health Ireland at Crumlin
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1.0 Introduction

The spinal navigation system receives and transmits data about anatomy of the spine and placement of implants, displaying the information on a computer screen where the surgeon can view it. The navigation system is composed of a computer workstation with a screen, software, a tracking system, and surgical instruments. The tracking system is composed of small reflective spheres that are attached to the patient (spine reference array) and tracked by an optical camera to register the location of the anatomical structures. The computer develops a model of the spine and projects the image onto a monitor. The surgeon touches parts of the patient's anatomy with a pointer so the computer can identify and register those points in its memory, including specific bone structures, the anatomy, the motion and alignment of the patient's normal anatomy, and the optimal joint alignment. With this information, the computer can guide the surgeon in placing the pedicle screws.

2.0 Definition of Guidelines

Spinal navigation is an image-guided technology for spinal surgery, which delivers more accurate pedicle screw placement by receiving and transmitting data about anatomy of patient's spine.

3.0 Applicable to

This guideline affects all theatre nurses, members involved in spinal surgery in the Operating Theatres at CHI Crumlin.

4.0 Objectives of Guidelines

This document provides guidance to theatre nurses in the use and care of navigation equipment and instruments. Proper care and handling of navigation equipment and instruments are essential to patient and personnel safety.

5.0 Definition / Terms


Spinal Navigation - an image-guided technology for spinal surgery, which delivers more accurate pedicle screw placement

Spinal deformity - a curvature in the spine where the alignment is outside of defined normal limits.

3D imaging - visual representations of the interior of the body through which a surgeon can see a true picture of the anatomy.

Pre-Registration of images - The process of aligning patient anatomy with the radiographic imaging before surgery.

Intra-operative registration of images - The process of aligning patient anatomy with the radiographic imaging during surgery.

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6.0 Procedure

Role of Circulating Nurse


- Operating Room Set Up
 - Call radiographer to notify navigation case pre op and present for case, on extension 6455.
- Undock the monitor and the camera by pushing the docking pedal down and pull apart.
- Plug in the machine.
- Connect the monitor to the camera.
- Insert the intraoperative data cable from the 3D Ziehm on to the screen.
- Switch on the mains power.
- The circulating nurse must secure the drapes with sleek to the table in order to keep the underside of the table clear during screening. A scissors must be available at all times to use in case of emergency to cut the frape and to transfer the patient.

6.1 Software Set Up

- Switch on the mains power switch and wait until camera warms up.
- Select 3D navigation under spine & trauma.
- Select “spine and trauma”.
- Refresh to ensure that the camera, monitor and 3D Ziehm are connected.
- Select new scan.
- Make sure that all three reflective marker spheres in the spine reference array are visible on screen (Yellow Colour).
- Radiographer performs the collision check and once completed ensure the three reflective marker spheres in the spine reference array are visible on screen (Yellow Colour) and the six reflective marker spheres on the C-arm drapelink appears on screen (Purple).
- The radiographer will carry out a spin. If the thoracic spine is being visualized, the anaesthetist will be asked to do a breath hold on patient before the spin. Once the spin is completed, the data will automatically be transferred and appears on to the BrainLab navigation monitor.
- Adjust colour and contrast as required. Switch off canopy lights to enhance viewing.
- Select patient orientation and confirm patient’s position (prone).
- Select surgeon’s position on screen – left side if surgeon is on the left and vice versa. If camera is at the head end, select head / feet. If camera is at the foot end, select foot / head. Confirm the setting with the surgeon.
- The surgeon will verify accuracy.

6.2 Role of the Scrub Nurse

- Cover the Ziehm C-arm with the sterile Ziehm C-arm cover.
- Disposable, sterile reflective marker spheres are attached to reference arrays, C-arm drapelink and pointer before calibration or use in surgery to enable the system to detect the position of the patient and instruments in the surgical field.
- Fix the C-arm drapelink on to the C-arm.
- Marker spheres must be counted as per the CHI at Crumlin perioperative count policy.

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- Hand the radiolucent clamp, spine reference array, extension attachment to the surgeons.
- Have pointer prepared with three radiolucent spears attached. This must be covered during the collision check.

6.3 Post Procedure

- Remove all reflective marker spheres and dispose as per CHI at Crumlin Waste Disposal Policy.
- All reusable instruments must be sent to HSSD for decontamination and sterilisation.

6.4 Cleaning, Disinfection and Sterilisation

- Wipe the screen and camera with square gauze and sterile water and dry appropriately.
- Clean the rest of the monitor cart and camera post with detergent and dry appropriately.
- Apply screen protection provided and the monitor and camera is ready for docking and transport.

6.5 Docking and Transport


- Monitor Cart - Loosen all locking knobs. Move the upper arm out of the way of the lower arm. Rotate the lower arm to the position indicted until the parking symbols align. Tighten the locking knob.

6.6 Camera

- Locate the park symbol on the camera post. Press the button on the telescopic post handle to move the post into the parking position.
- Fold the camera arm down with the handle until firmly aligned to the post.
- Rotate the camera to the side with the handle.
- Fix the camera to the post with the Velcro protection cover strap.
- Push the camera cart into the monitor cart quickly until the docking pedal pops up (Please make sure that the docking pedal is down before docking).

6.7 General Rules for Use

- Set up the operating room prior to surgery to ensure that the camera and screen are in working condition and ready for navigation.
- The equipment and instruments are accurate and sensitive medical devices and must be handled with extreme care.
- Do not use damaged or corroded instruments.
- The marker spheres of the pointer and the array must be visible to the camera at all times during registration and navigation.
- Only use clean and dry marker spheres. Wet or soiled marker spheres must either be cleaned and dried before further use or replaced. Only use a soft cloth moistened with sterile water to clean the surface of soiled spheres. Ensure that the cleaned marker spheres is absolutely dry before use.
- Do not mask or cover any marker spheres, otherwise navigation is not possible or may be inaccurate.
- Always store pointers in their designated inserts in the pointer gauge to prevent pointer damage.
- Electrical cords and plugs should be checked for fraying and damage prior to each use.

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- Following use, personnel should turn off the BrainLab navigation machine, clean all reusable parts and inspect these parts according to the manufacturer's written instructions.
- Inaccurate instruments must be returned to BrainLab for testing.
- If troubleshooting fails, call clinical engineering on bleep 8445.

7.0 Implementation Plan

- Initial education will include Education Programme (Appendix 1), Hands on Training (Appendix 2), Demonstration (Appendix 3).
- Ongoing continuing education regarding the use of BrainLab navigation machine should be provided to all theatre nurses.
- A brief set of clearly readable operating instructions should be readily accessible with the BrainLab navigation machine. These instructions should be placed or attached to the BrainLab navigation machine for reference. Manufacturer's operational manual should be readily available.
- It is the responsibility of individual staff member working in the perioperative setting to ensure that they are competent, accountable and responsible in the safe use of BrainLab navigation machine.

8.0 Evaluation and Audit

Monitoring of compliance is an important aspect of procedural documents. Staff competency must be reviewed on a regular basis and ongoing training will be provided to maintain competencies.

9.0 References

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10.0 Appendices

Appendix 1 - Education Programme Overview

Date:	Time	Activity	Remarks
Day 1	08:00 – 09:00am	Basic Spinal Anatomy and its Importance in Spinal Navigation Assessment	
	09:00 – 10:00am	Introduction to Spinal Navigation	
	10:00 – 11:00am	Theory and Hands on Training <ul style="list-style-type: none"> • Instruments • OR Set Up • Software Set Up 	
	11:00 – 11:15am	Coffee	
	11:15 – 13:00	Theory and Hands on Training <ul style="list-style-type: none"> • Instrument Calibration • Automatic Registration 	
	13:00 – 13:30	Lunch	
	13:30 – 15:00	Theory and Hands on Training <ul style="list-style-type: none"> • Manual Registration: Paired Point Matching • Manual Registration: Region 	
	15:00 – 15:15	Coffee	
	15:15 17:00	Theory and Hands on Training <ul style="list-style-type: none"> • Per op CT- Data Transfer • Trouble Shooting • Aftercare of BrainLab Machine 	
Day 2, 3		Training Live Case	
Day 4, 5, 6		Training – Under Supervision	
Day 7, 8, 9, 10		Training Independent	
<p>N.B. The agreed timeframe for completing this training programme is 3 weeks. Day 1 will include lecture, demonstration and hands on training. Day 2, 3 will be observation in theatre, Day 4, 5, 6 will be training under supervision and day 7, 8, 9 & 10 will be independent training.</p>			

Appendix 2 - Training Record


Procedure	Date:		
	Observed	Performed Under Supervision	Performed Independently
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Appendix 3 - List of Instruments and Equipment – Demonstrated & Used

Equipment	Demonstrated	Used				
3D C-Arm						
Camera						
Monitor						
C-Arm Drapelink						
Reflective Marker Sphere						
Sterile Remote Control						
Instrument Calibration Matrix						
Pointer						
Radiolucent Clamp						
Spine Reference X Clamp						
Wrench						
Reference Array						
Instrument Adapter Clamp						
Instrument Adapter Array						
Tool for Instrument Adapter Array						

Appendix 4 - Assessment

Theoretical Assessment	Sign & Date		Remarks	
Have read and signed relevant local SOP.	_____	___/___/20__		
Have attended training and educational sessions on spinal navigation.	_____	___/___/20__		
Have updated competency book and training record, on site and readily available.	_____	___/___/20__		
Have attended radiation safety training.	_____	___/___/20__		
Clinical Assessment	Observed	Participated	Supervised	Comments
Role of Scrub Nurse				
Covering the Ziehm C-Arm				
Attach disposable, sterile reflective marker spheres to reference arrays, C-arm drapelink and pointer before calibration or use in surgery.				
Fix the C-arm drapelink on to the C-arm				
Marker spheres must be counted as per the CHI Crumlin Perioperative Count Policy.				
Correct handling of the radiolucent clamp, spine reference array, extension attachment and wrench.				
Software Set Up				
Camera warm up				
Set up monitor				
Demonstrate knowledge on collision check by radiographer				
Demonstrate understanding on breath holding by anaesthetist				
Automatic transfer of data on to the BrainLab				

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navigation monitor				
Adjust colour and contrast as required				
Select patient orientation and confirm patient's position (Prone)				
Select surgeon's position; left side if surgeon is on the left and vice versa				
If camera is at the head end; select head/feet.				
If camera is at the foot end; select foot / head				
Verification accuracy by surgeon				
Docking the Transport				
Monitor cart				
Camera				
Dock the camera cart into the monitor cart				
Cleaning, Disinfection and Sterilisation				
Remove all reflective marker spheres and disposal as per CHI Crumlin Waste Disposal Policy.				
All reusable instruments must be sent to HSSD for decontamination and sterilisation.				
Wipe the screen and camera with square gauze and sterile water and dry appropriately.				
Apply screen protection provided and the monitor and camera is ready for docking and transport.				

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