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Guidance For:

Prevention, diagnosis and management of Plexopathy during prone positioning

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Prevention, diagnosis and management of Plexopathy during prone positioning

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Introduction

Throughout the recent COVID-19 pandemic the critical care community has been treating increasing numbers of patients with severe hypoxia and ARDS. Approximately 5% of all COVID-19 patients will require mechanical ventilation on an ICU, with a further 14% requiring oxygen therapy.[1]

Prone positioning has been recommended for ARDS patents with moderate to severe hypoxaemia (PF ratio < 150mmHg) since the publication of the PROSEVA trial; more recent meta-analyses and a Cochrane Systematic review, also support the early use of prone ventilation in patients with moderate to severe ARDS to improve oxygenation and reduce mortality when compared with conventional supine ventilation.[2-4]

Internationally, observations of critical care clinicians treating these patients in Critical Care have reported that patients with moderate to severe ARDS appear to have responded well to invasive ventilation in the prone position, leading to prone ventilation being recommended in international guidelines for the management of COVID-19.[5] Most guidelines advocate that patients remain in the prone position for a minimum of 16 hours to maximise the benefit from this intervention. This however results in an increased risk for the development of complications. NHSi brought this issue to the attention of the ICS a couple of years ago and as a result the Joint FICM/ICS guidelines on prone positioning in Intensive Care were produced.[6] The main aim was to standardise the process of prone positioning and ensure adequate awareness of the associated complications and how to minimise their occurrence.

Given the recent presentation of a number of cases of brachial plexus injury known as Prone Position Plexopathy (PPP), both the ICS and BOA felt that is was necessary to produce some further guidance to help minimise the risks associated with prone positioning, particularly given the increased number of patients we have placed in the prone position over recent months.

This short guideline aims to address concerns about the risks of proning and does not purport to address all causes of peripheral nerve injury from ITU care but to function as a guidance document towards best practice in positioning for placing patients in a prone position.

Prevention

The “swimmer’s position”, with one arm adducted and the other abducted, is advocated by many international guidelines including those produced by the ICS.[6-8] The decision to recommend this position was based on a consensus opinion. Traditionally it was adopted to reduce the difficulties in positioning patient’s heads and endotracheal tubes; to reduce the risk of developing facial pressure sores and to ensure adequate access to patient’s IV lines etc. Unfortunately, the asymmetrical arm positions employed in the swimmer’s position risk traction and compression injuries to the plexus of the adducted arm especially if the head is excessively laterally flexed.

Both the ICS and BOA recognise the need to place people in the prone position to improve both oxygenation and survival in ARDS; however we also recognise the need to apply our understanding of biomechanics and injury patterns to reduce the risk of prone positioning and prevent PPP in these patients.

For that reason, we encourage all clinicians to familiarise themselves, with the following positioning guidance, and ensure that patients are being appropriately positioned when in the prone position to avoid the injurious positions described below.

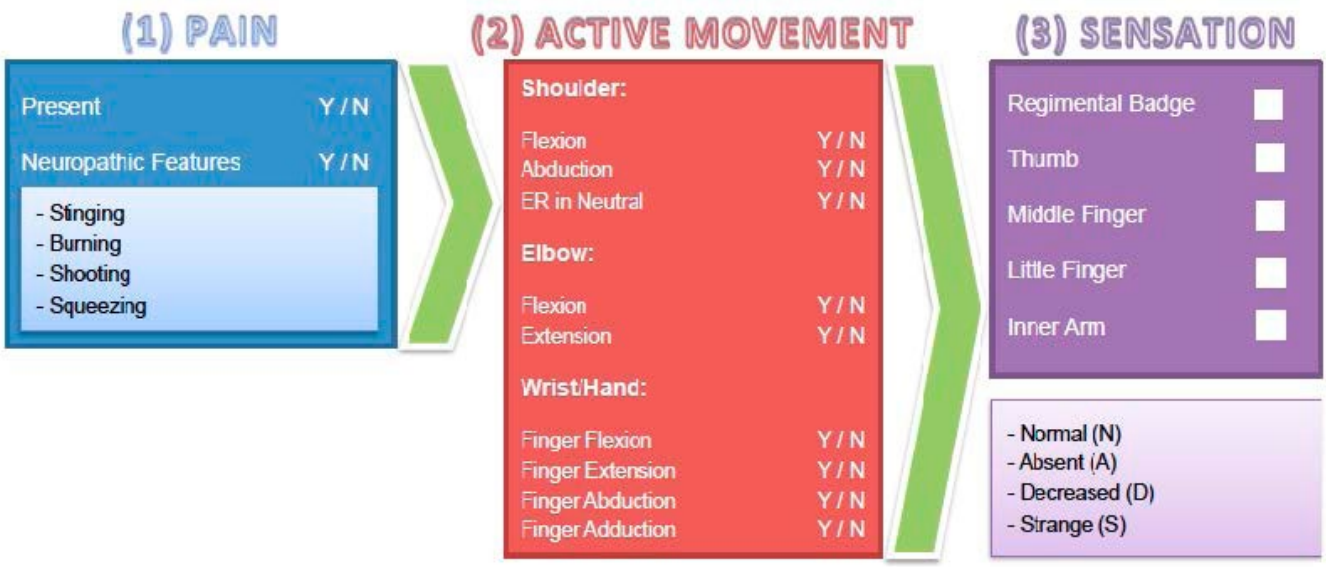
Recommendations:	Avoid where possible:
Slide the scapulae up the back with slight shoulder shrug[2].	Depression of the shoulder girdle[2].
Maintain spine alignment[3].	Excessive lateral flexion of the neck[3].
Place arms in *‘swimmers position’* with one arm by the patents side and the other abducted within 45-70 degrees[4].	Excessive rotation of the head/neck[3.5].
The position of the arms should be carefully alternated every 2 hrs	Extention of the neck[7].
The chest should be well supported to ensure the shoulder is forward flexed[6].	Extention of the shoulder.
The head should be rotated towards the abducted arm.	Shoulder Abduction>70 degrees[6].
Maintain neck support when both moving and positioning patents.	

Figure 1. Recommendations taken from the Royal National Orthopaedic, Peripheral Nerve injury Unit by the authors.[11]

Clinical Assessment of Patient Post Prone Positioning

We advocate that clinicians should screen all patients for potential neurological symptoms who have been nursed in the prone position at earliest possible opportunity. This may be following extubation, during the weaning phase following tracheostomy or potentially at follow up clinics post discharge. During this assessment patients should be directly questioned about the presence of neuropathic pain and each patient should be examined to see whether they exhibit active movement in each muscle group and to ensure they have intact and normal quality of sensation throughout the upper limb. Muscle groups to be assessed:

- Shoulder elevation and external rotation
- Elbow flexion and extension
- Wrist flexion and extension
- Finger flexion and extension
- Finger abduction and adduction

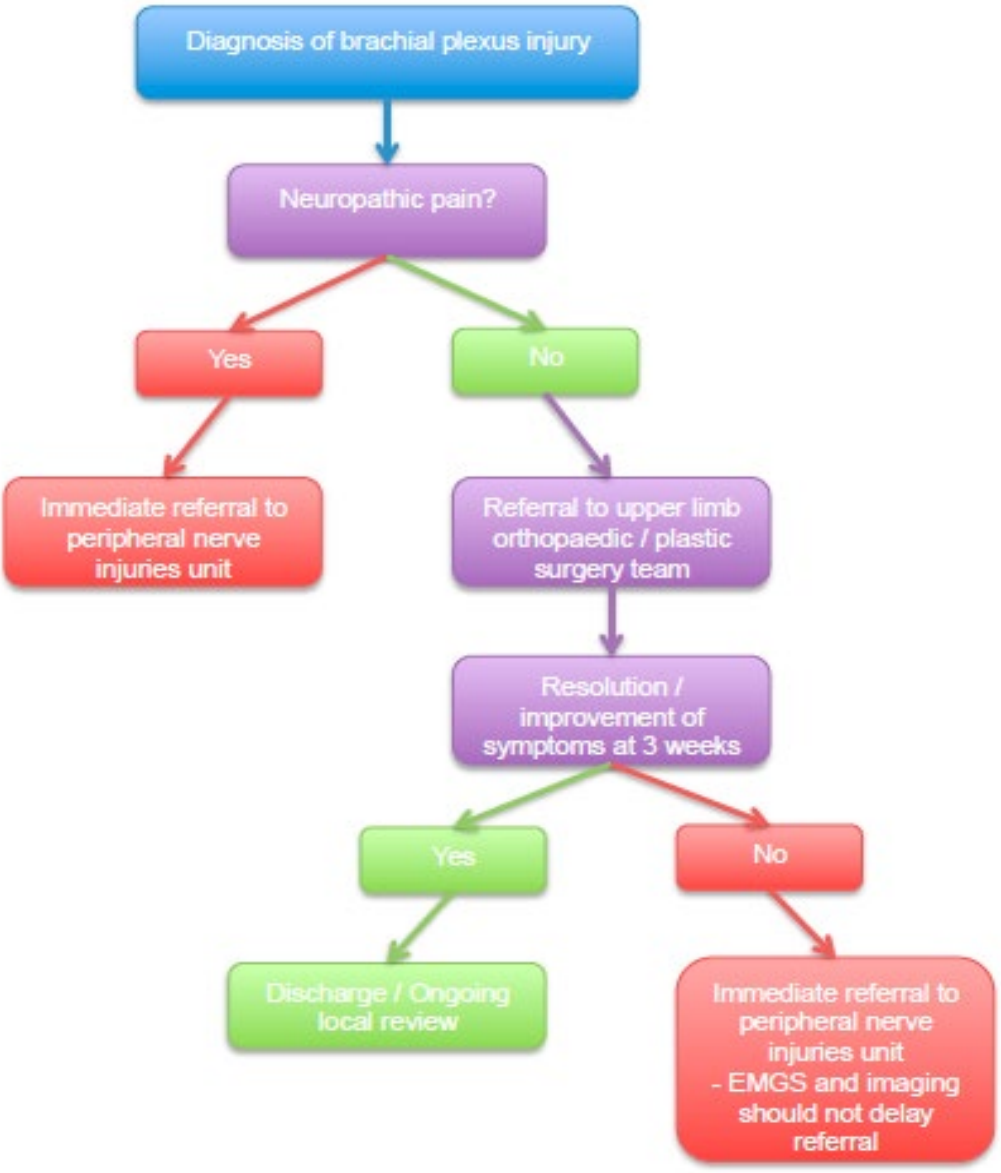


Management

Once identified if the palsy is painless, conservative management can be employed however if symptoms persist longer than 3 weeks referral to Orthopaedics is recommended.

If there is neuropathic pain or painful palsy, then the patient should be referred urgently to a clinician expert in nerve injury treatment.

The following flow chart provides an aide memoir to when a referral should be triggered.



It is recognised that whilst prone positioning has been identified as a cause of plexopathy there are a number of other aetiologies of neuropathology which should be considered both from acute illness in general but specifically from the SARS Cov-2 virus. There are emerging data toward a theory of vascular injury (with micro haemorrhage and emboli) and direct inflammatory change to the central and peripheral nervous system to which patients from this COVID cohort may be identified as suffering from.[9,10]

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