

# Biochemical abnormalities and other complications of prone positioning for spinal surgery

JH Taylor, V Nagaratnam, S Sengupta, EM Hoogenboom, AMV Luoma

National Hospital for Neurology and Neurosurgery, UCLH NHS Foundation Trust, London, UK

## Background

Prone positioning for surgery is associated with complications [1] including visceral hypoperfusion and rhabdomyolysis [2,3]. Known factors linked with complications include obesity, blood loss and duration of anaesthesia [4,5]. At our institution the prone position is commonly used for both spinal and intracranial surgery. Our standard technique is to use a Montreal Mattress with a 'Prone View' or Mayfield Clamp as indicated.

## Objective

To quantify the incidence of complications following prone positioning after spinal surgery at our institution and identify associated factors.

## Method

Following registration with the local Clinical Governance committee, a prospective audit was conducted for two 6-month periods between April 2012 and April 2014. All patients undergoing spinal surgery were included. Data collected included patient demographics, surgical details, medical history and where available blood analysis for renal and liver function. Complications related to prone positioning were collected intra-operatively, immediately and 24 hours post-operatively. Patients with nerve complications were followed-up until resolution. Acute kidney injury (AKI) was defined as a rise in plasma creatinine of 26.5IU/L or an increase of 1.5 times from baseline.

## Results

160 patients were included. The incidence of immediate and late complications were high (58.8% and 46.3%), but most were relatively minor (facial oedema and chemosis) and resolved rapidly. Long-term major complications were rare. We observed peripheral nerve injuries in 8.8% of cases (with one case of permanent nerve damage), grade 1 pressure sores in 1.9%, and AKI in 1.9% of cases. During our study period no patient suffered from post-operative visual loss (POVL).

## References

1. Edgecombe et al BJA 100 (2): 165-183 (2008)
2. Ziser et al Anesthesia and Analgesia 82 (2): 412-415 (1996)
3. Papdakis et al Journal of Neurosurgery 9 (4): 387-398 (2008)
4. Lee et al Anesthesiology 2006; 105:652-9
5. The Postoperative Visual Loss Study Group Anesthesiology 116 (1): 15 – 24 (2012)

Cardiovascular complications were transient and included episodes of unplanned hypotension (15) and arrhythmias (4). Airway problems were more serious; the majority were reversible episodes involving high airway pressures or hypoxia, but there were 2 cases relating to the internal diameter of endotracheal tube shearing and 2 pneumothoraces. ITU admissions occurred following surgery complicated by unanticipated blood loss (2), seizures (1), and airway issues including oedema (1) and respiratory failure (3).

Abnormalities	Immediate and intra-operative complications [number, %]	Complications 24 hours post-prone position [number, %]
<b>Immediate:</b>		
Lactate >2.5 mmol/l	6 (3.8%)	
Abnormal base excess	18 (11%)	
<b>24 hours post-operative:</b>		
Acute kidney injury		3 (1.9%)
Creatine kinase > 2x rise		41 (26%)
> 5x rise		18 (11%)
ALT (Male >50IU/L, Female >35IU/L)		15 (9.4%)
ALP (Male >129IU/L, Female >104IU/L)		4 (2.5%)
Amylase (>2x rise)		8 (5%)
<b>Intra-operative:</b>		
Airway compromise	16 (10%)	
Cardiovascular instability	19 (12%)	
<b>Immediate post-operative:</b>		
Airway	3 (1.9%)	
Respiratory	9 (5.6%)	
Facial oedema	39 (24%)	
Chemosis	49 (31%)	
Reactive hyperaemia	25 (16%)	
Unplanned ITU admission	7 (4.3%)	
<b>24 hours post-operative:</b>		
Peripheral nerve injury		14 (8.8%)
Compartment syndrome		0
Pressure sores		3 (1.9%)

	All patients [n=160]	Immediate and intra-operative complications [n=94]	Complications 24 hours post-prone position [n=74]
<b>Patient demographics:</b>			
Median age [range years]	59 [21-95]	61.5 [21,95]	61 [21,84]
Gender M:F	72,88 [45:55]	42,52 [44.7:55.3]	30,44 [40.5:59.5]
BMI [mean, SD] kg/m <sup>2</sup>	27.0 [± 6.24]	25.7 [± 10.9]	25.9 [± 9.6]
<b>Surgical details:</b>			
Number of vertebral levels:			
1	80	45	36
2	47	21	18
≥3	23	26	19
Unknown	10	2	1
Estimated blood loss:			
< 1000ml	131	56	47
> 1000 ml	18	7	5
> 1500ml	11	5	5
Mean blood loss [SD] ml	751 [±1212]	579 [±774]	765 [±1227]
Mean duration of surgery [SD] minutes	160 [±112]	143 [± 110]	156 [±122]

## Conclusion

An unexpectedly large number of our patients had abnormal biochemistry post-operatively; elevated liver enzymes and amylase suggestive of peri-operative organ hypo-perfusion were frequently observed. There is little data to quantify a normal plasma creatine kinase [CK] concentration following either spinal surgery or prone positioning. In our patient group plasma CK was elevated in over a quarter of cases but without evidence of clinical rhabdomyolysis.

Complications appeared unrelated to either patient factors (age, gender, BMI) or surgical factors (number of vertebral levels operated on, blood loss or duration of surgery). Our results justify the need for informed consent for both rare but serious complications such as POVL, and minor complications such as chemosis. Careful patient positioning to minimise the inherent risks associated with prone positioning is required and thorough follow-up, including biochemical investigations where appropriate, is essential.

