Should the Beach Chair Position Have National Guidelines To Reduce The Risk of Cerebrovascular Complications? Results from a National Survey of Surgeons and Anaesthetists

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Abstract

Background

The beach chair position is frequently used in UK shoulder surgeries, but cerebrovascular complications, while rare, can have severe consequences. No consensus exists on best practices due to limited evidence.

Methods

An online survey was conducted among the British Elbow and Shoulder Society (BESS) and Society of Regional Anaesthesia (SRA) members to gauge the need for guidelines. Questions covered respondent demographics, clinical experience, availability of local guidelines, beach chair positioning, choice of anaesthetic agents, blood pressure and cerebral blood flow monitoring, techniques to maintain cerebral blood flow, personal experience of permanent postoperative cerebrovascular complications and appetite for UK guidelines.

Results

Of the 534 respondents, 67% were anaesthetists and 33% surgeons. Just 12% currently use local guidelines. 40% conduct all shoulder surgeries in the beach chair position. The most common bed angle is 45°, but 30% choose 60° or higher. Only 20% of anaesthetists use cerebrovascular monitoring, with 6% of surgeons and 2% of anaesthetists reporting postoperative neurological issues. 85% of respondents indicated a desire for national guidelines.

Conclusions

Current practices in the use of BCP vary considerably but there is a strong desire for guidelines. BESS intends to develop a consensus approach based on current available evidence and practice.

Background

The beach chair position (BCP) is commonly used for open and arthroscopic shoulder surgery in the UK. The theoretical advantages of BCP over the alternative, lateral decubitus position, include better access for open anterior surgery, the option of having a free and mobile arm and a reduced risk of a brachial plexus traction injury (1).

Concerns regarding the use of the BCP have been highlighted, specifically linked to the risk of cerebrovascular complications due to cerebral hypoperfusion. The exact aetiology has not been established and is likely to be multifactorial and considered to be the result of periods of hypotension leading to cerebral hypoperfusion, decreased cerebral perfusion due to the upright position of the patient and/or altered cerebral homeostasis due to anaesthetic agents (1–3).

If cerebral hypoperfusion is prolonged, this may result in neurological sequelae (stroke, spinal cord ischaemia, visual loss and death (2,3). The true incidence of these events is estimated to be 0.004%, which is 1 in every 25000 procedures (4). Although it appears low, it probably equates to a single annual incidence in the UK. This raises the question of whether there should be national guidelines for the BCP to reduce the chance of these adverse events occurring.

To reduce the risk, there are a variety of methods of monitoring cerebral perfusion, such as Near-Infrared spectroscopy, jugular venous oxygen saturation, transcranial Doppler ultrasound, and electroencephalography; however, each has limitations on detecting true cerebral ischemia (3). There is no current consensus on the best practice to reduce these events from occurring due to the low level of supportive evidence available; however, the Australia Shoulder and Elbow Society has offered guidance, and local protocols and "technical notes" are available in the literature (1,5,6). The UK has not established guidelines, but events have occurred, and as a result, a survey was prepared for BESS 2022 to assess the appetite for guidelines.

Methods

Members of the British Elbow and Shoulder Society (BESS) and the Society of Regional Anaesthesia (SRA) were invited to participate in an online survey between June and September 2022. The a-priori statistical analysis plan was for descriptive statistics only. Responses were summarised using Excel or described as categorical narrative results as appropriate. Individual responses were not validated. All responses were anonymous, and there was no formal consent process. Completion of the survey was taken as implied consent. Within the survey, there were questions answered by both surgeons and anaesthetists, by anaesthetists only and by surgeons only.

Survey contents

A copy of the completed survey is provided in appendix 1. There were sections that covered the individual, their level of clinical experience and standard clinical practice.

Due to the rarity of neurological complications, we asked if any respondents had personal experience of permanent neurological deficit postoperatively and if respondents would value national guidelines for beach chair position practice.

Results

There were 534 respondents (67% anaesthetists, 33% surgeons), of which over 70% completed the full survey.

1. What is your specialty?		
Category	**n**	**n (%)**
Shoulder Surgeon/ AHP	178	33.3
Anaesthetist	356	66.7

2. In what capacity do you work? (Surgeon only question)		
Category	**n**	**n (%)**
Consultant Surgeon	102	79.7
Post-CCT Fellow, Surgeon	17	13.3
Registrar or equivalent, Surgeon	4	3.1
Retired Surgeon	1	0.8

Allied health professional (AHP)	2	1.6
Other	2	1.6

4. Do you have local guidance in regards to the use of the Beach Chair positions in theatres?

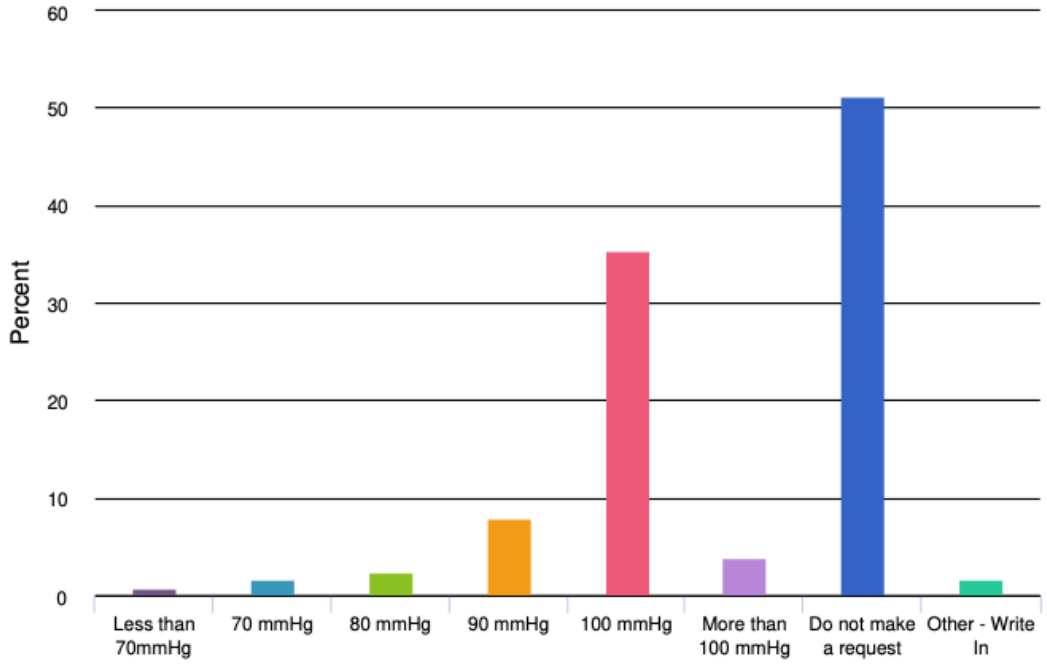
Category	**n**	**n (%)**
Yes	47	12.4
No	258	68.3
I do not know	19.0	19.0
I prefer not to answer	0.3	1

6. What percentage of shoulder surgeries do you do in a beach chair position? (mixed respondents)

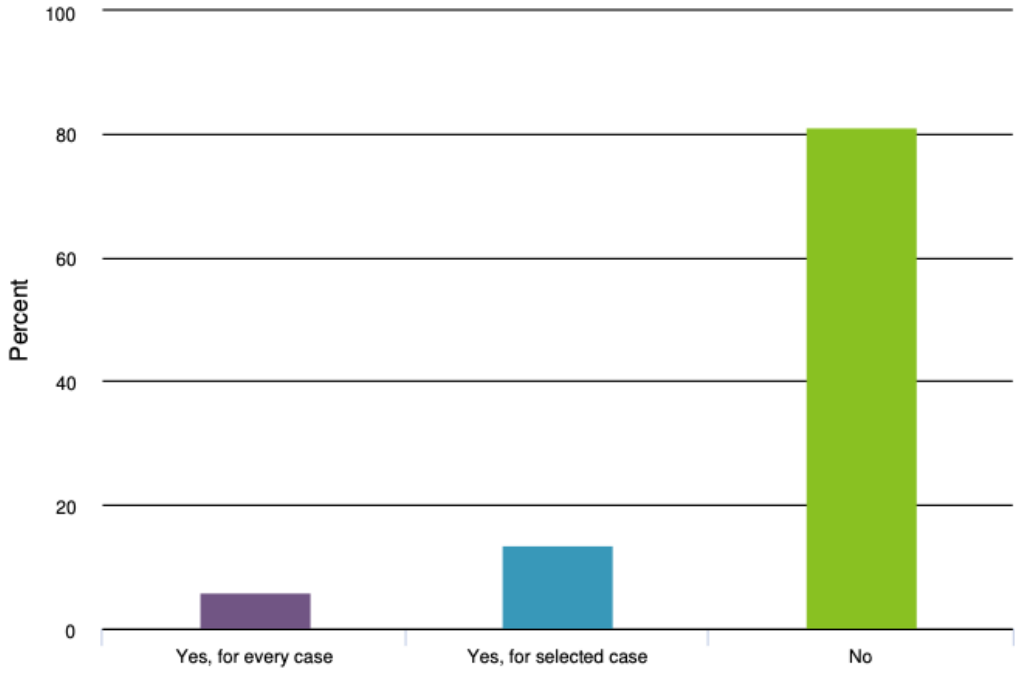
Category	**n**	**n (%)**
0-10%	13	3.4
10-20%	16	4.2
20-30%	6	1.6
30-40%	14	3.7
40-50%	19	5.0
50-60%	15	4.0
60-70%	30	7.9
70-80%	56	14.8
80-90%	54	14.3
90-100%	152	40.2
I do not operate in beach chair position	3	0.8

9. What angle do you set the table at when operating on patients in the beach chair position during open shoulder surgery?		
Category	**n**	**n (%)**
30°	81	21.5
45°	152	40.3
60°	105	27.9
More than 60°	39	10.3

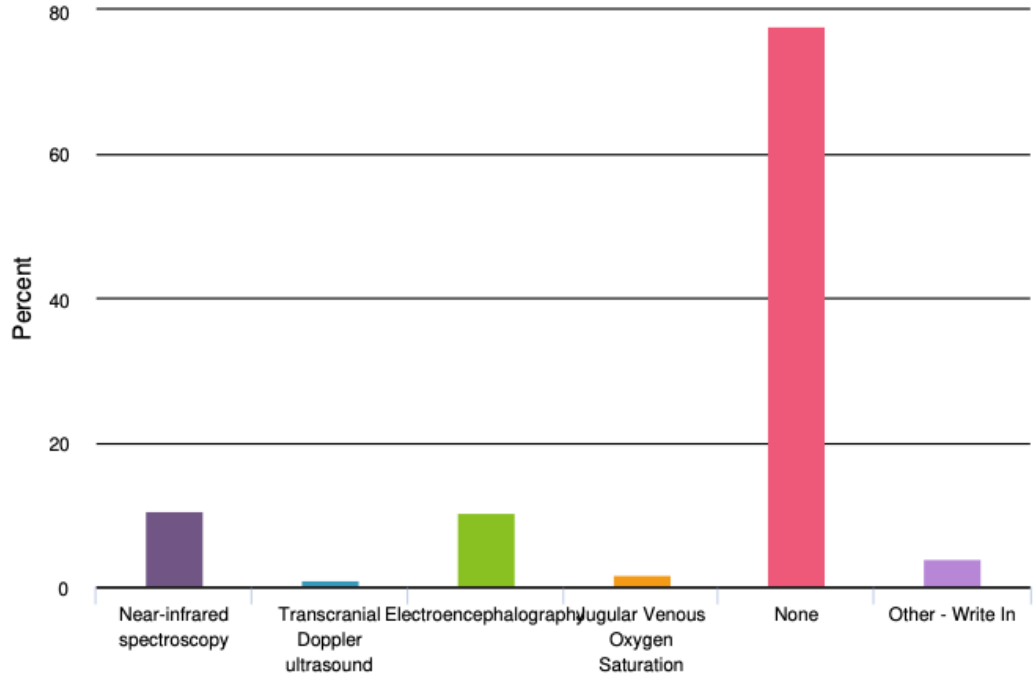
10. During beach chair shoulder surgery what systolic pressure do you request that the blood pressure is kept below (non-invasive cuff on the contralateral arm)?



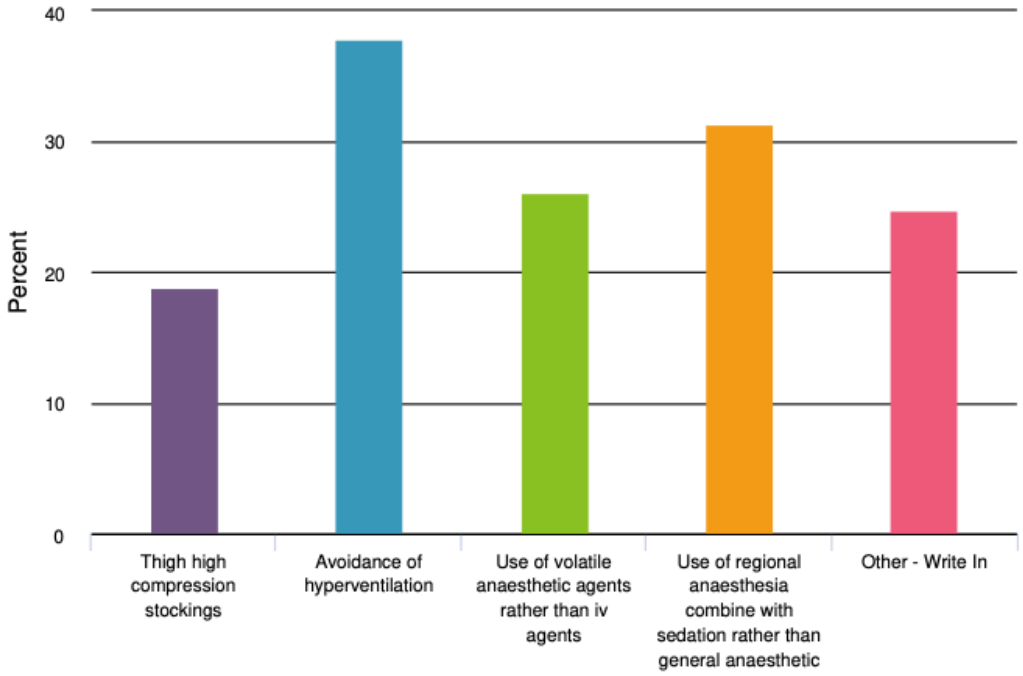
13. Do you/your anaesthetic team routinely monitor the cerebral blood flow?



14. Do you/your anaesthetic team use any of the following routinely to monitor cerebral blood flow?



15. Do you usually use other methods for helping to maintain cerebral blood flow?



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18. Have you had a personal experience of a patient waking up from shoulder surgery- undertaken in the beach chair position- with a permanent neurological deficit?		
Category	**n**	**n (%)**
No	365	96.6
Yes	13	3.4

19. Would you value national guidelines on safety while performing shoulder surgery on patients in the beach chair position if BESS were to publish formal guidance?		
Category	**n**	**n (%)**
No	57	15.1
Yes	320	84.9

Discussion

The result of the survey indicates that although BCP is widely used for shoulder surgery. There is a wide variation in the application of BCP with varying levels of angles used as well as different choices of cerebrovascular monitoring and prevention measures. Additionally, there is a lack of local guidance and appetite for a national guideline relevant to UK practice among the BESS community.

Some institutions recognise a need for BCP guidelines, and there have been recent changes in the private sector with practice change instructions provided without evidence to support it **(?reference).** Guidelines are available from the Australian Orthopaedic Association (6). These guidelines focus on monitoring of blood pressure, oxygen saturation, patient selection and positioning, blood pressure management, and anaesthetic technique. Whilst these are important factors to consider to reduce the risk of cerebrovascular hypoperfusion, it is unclear what evidence has been used to support these guidelines. This presents an opportunity to develop new BCP guidelines based on current practice through our survey and current evidence. The evidence base to support the guidelines would be established through a systematic review or consensus, depending on the quality of the literature available.

When putting together guidelines for BCP usage, there are a number of factors to consider which will have an impact on maintaining safe levels of cerebral blood flow; Patient specifics (age, comorbidities, pre-operative medications, circulating volume status), anaesthetic specifics (anaesthetic agents, ventilation type, intra-operative monitoring, desired MAP, adjuncts to improve cerebral blood flow), angle of beach chair and specifics related to the surgical procedure (blood loss, complexity, and length). Many studies have looked at many of these factors and their effect on systemic and cerebral blood pressure and cerebral oxygen supply and demand, specifically when placing patients in the BCP (3,7,8). However, probably due to a high number of variables and a paucity of adverse neurological events, there is little by way of absolute values and hard data to provide guidance. There is a need to develop consensus and evidence-based guidelines that BESS could lead on.

Potential BCP guidelines aim to provide advice on optimal bed angle, blood pressure maintenance, and anaesthetic agents to reduce the risk of cerebrovascular complications, and cerebral perfusion monitoring as well as highlight high-risk patients' characteristics. Although Salazar et al. demonstrated that a BMI >35 was a risk factor whilst diabetes, smoking, hypertension, obstructive sleep apnoea and coronary artery disease were not, risk factors for perioperative stroke for orthopaedic surgery, they should still be considered (9–11).

A key limitation with survey based data collection is the potential for responder bias with more research focused members completing the survey and as a result our responses may not represent the wide shoulder surgical community. These responses may not be an accurate reflection of the current practise in their institution. Despite these limitations our results indicate a wide range of practise and a desire for the guidelines.

Conclusion

Our survey would suggest that current practices in the use of BCP vary considerably across the country but there is clearly a strong desire for guidelines from both surgeons and anaesthetists. Complications are rare but catastrophic so safety guidelines would be welcome even if difficult to prove a direct correlation between their introduction and a reduction in neurological complications. At the same time, they need to be pragmatic with minimal impact on the ability for surgeons to perform shoulder surgery in optimal conditions. BESS intends to develop a consensus approach based on current available evidence and practice to put these together but in the interim, the Australian guidelines may provide some useful guidance.

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Appendix

Should we add this back into the discussion?

There are many factors during BCP that may influence cerebral perfusion from a surgical and anaesthetic perspective. Murphy et al summarised the current literature on BCP safety. To monitor cerebral perfusion, a variety of methods are available such as Near-Infrared spectroscopy, jugular venous oxygen saturation, transcranial doppler ultrasound and electroencephalography however each has limitations on detecting true cerebral ischemia (1). They highlight that although NIS and EEG are commonly used methods they have limited depth penetration and coverage of the cerebral tissue highlighting that these are not completely reliable. Studies assessed in their literature review recruit low numbers of patients and there is no consensus within the literature for values of baseline cerebral perfusion or cerebral hypoperfusion as well as a safe lowest blood pressure value to be maintained for BCP surgery and a result the safest approach is to maintain MAPs close to baseline throughout the procedure (1).

Suggested treatment strategies to maintain perfusion focus on maintaining cerebral perfusion through avoiding hyperventilation, choice of anaesthesia and drugs and BCP angle position. The reason to avoid hyperventilation during general anaesthesia is due to theory that hyperventilation results in cerebral vasoconstriction and reduction in cerebral blood flow and with hypoventilation induces vasodilation and increases cerebral blood flow. However a potential risk with excessive hypoventilation may result in cerebral ischaemia .

Drug choice during anaesthesia can also affect cerebral perfusion with some studies demonstrating arginine vasopressin reduced cerebral perfusion compared to saline. The background anaesthetic may also influence the impact of vasopressors with a more significant defreese in jugular venous bulb oxygen saturation in patients receiving propofol-remifentanil group compared to sevoflurane-nitrous oxide group (1)

An alternative to surgery under GA is the use of regional anaesthesia with sedation which may reduce cerebral desaturation events which may be due to the avoidance of hyperventilation (1).