South African Neurosurgical Patient Management Survey

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Introduction

A growing awareness of the differences that existed within South Africa in terms of the management of Neurosurgical patients prompted the academic Neurosurgical unit at Wentworth hospital to embark on a nationwide survey to determine a national management standard for Neurosurgical patients.

The objectives of the study

Primary objective: to determine present South African practice standards in key areas of Neurosurgery.
Secondary objective: to determine whether specific factors, including the postgraduate training centre, the region of practice, public and/or private sector practice, influenced patient management strategies.

Method

Questionnaires were circulated to the 84 members of the Society of Neurosurgeons of South Africa, a group encompassing the majority of neurosurgeons practicing within the borders of South Africa. Additional questionnaires were distributed at related anaesthetic and neurosurgical scientific meetings.

The survey identified key areas of patient management including subarachnoid haemorrhage (SAH), traumatic brain injuries (TBI), posterior fossa and spinal surgery.

Statistical analysis of the data received was performed to determine correlations between demographic factors and management protocols. Statistical methods included Chi-square, Likelihood ratio Chi-square, Mantel-Haenszel Chi-square and Fisher's exact test

Results

In the survey a thirty-eight percent response was achieved to the initial circulation of questionnaires. Subsequently an additional six returns were received at related scientific meetings.

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Respondent Data and Demographics

By far the greater majority of the respondents, 94.7%, were male. This closely reflects the present demographics of South African neurosurgeons where female surgeons have made little inroads into the male dominated field of Neurosurgery.

The large majority of respondents 89.5% graduated after 1970, with 50% graduating after 1989. A more detailed breakdown of the results is shown in Table 1.

Table 1: Graduation Year

	Number	*Percentage*
<1960	1	2.6%
1960-69	3	7.9%
1970-79	10	26.3%
1980-89	7	18.4%
1990-99	13	34.2%
2000-01	4	10.5%

In terms of postgraduate training, all South African postgraduate Neurosurgical academic centres including the Universities of Cape Town, Natal, the Orange Free State, MEDUNSA, Pretoria, Stellenbosch and Wits were represented. Three respondents received their postgraduate training overseas. Table 2 displays the distribution of respondents from the various postgraduate centres.

Table 2: Postgraduate Training Centre

(University/Country**)*	*Number*	*Percentage*
Cape Town *	7	17%
Stellenbosch*	6	16%
Natal *	5	13%
Pretoria*	5	13%
MEDUNSA*	3	8%
Orange Free State*	3	8%
Nigeria**	1	3%
New Zealand**	1	3%
United Kingdom**	1	3%

Of interest in terms of the current debate concerning the need for a national unitary exit exam was the distribution between Masters and Fellowship qualifications as the route to special-

Table 3: Postgraduate Masters Degree		
University	*Number*	*Percentage*
Stellenbosch	6	15.8%
Orange Free State	4	10.5%
MEDUNSA	3	7.9%
Pretoria	3	7.9%
Natal	2	5.3%
Cape Town	2	5.3%
Postgraduate Fellowship		
	Number	*Percentage**
FCS(Neurosurgery)SA	14	60.9%
Fellowship Royal Colleges	7	30,4%
Other Colleges	2	8.7%
* Expressed as a percentage of the total indicating fellowships not the total of the respondents		

Table 4: Practice Sector*		
	Number	*Percentage*
Private Practice (PP) only	23	60.5%
PP + Service Hospital	1	2.6%
PP + Academic Hospital	2	5.3%
Academic Hospital only	8	21.0%
Academic Hospital +PP	2	5.3%
Service Hospital only	2	5.3%
* Predominant Area of Practice listed first		

Table 5: Practice Region		
(Province/Country**)*	*Number*	*Percentage*
Western Cape *	12	31.6%
Gauteng *	10	26.3%
KwaZulu-Natal *	8	21.1%
Eastern Cape *	4	10.5%
Northern *	1	2.6%
Orange Free State *	1	2.6%
Namibia **	1	2.6%
Nigeria **	1	2.6%

ist qualification, shown in Table 3. In several instances both the masters and fellowship qualifications were obtained by individual respondents.

Respondents active in the private sector accounted for two thirds (68.4%) of the replies with respondents confined to public sector activity accounting for the remaining third. There was some degree of overlap between the two sectors, outlined in Table 4, with a number of individual respondents being active in both segments.

The region in which the respondent practised was also of particular interest to us (Table 5). It was felt important to differentiate between the regions in which the respondents practised as opposed to the postgraduate training centres attended, in order to determine what factor had the greatest influence on patient management strategies.

Patient Management Strategies

The survey in turn focussed on the management of subarachnoid haemorrhage, intracranial aneurysm surgery, traumatic brain injury and monitoring and positioning aspects of posterior fossa and spinal surgery.

Medical Management of Sub-Arachnoid Haemorrhage (SAH)

The survey looked at medical management of SAH and surgical management of intracranial aneurysms separately. The result of the survey of medical management of SAH is tabulated in Table 6.

Detection of Vasospasm in SAH Disease

In terms of the method of detection employed, it was noted that although the majority of respondents, 94.7%, utilised clinical methods for the detection of vasospasm, most of these, 71.1%, supplemented clinical methods with angiography. Transcranial doppler detection was used by a minority, 21.1%, while only one respondent employed a cerebral flow study detection method.

Perioperative Management of Intracranial Aneurysm Surgery Patients

Distinct differences were noted in the perioperative approach to Aneurysm surgery with particular reference to the use of early and late clipping of aneurysms[1] and temporary clipping during surgery. There were also notable differences in terms

Table 6: Medical Management of Sub-Arachnoid Haemorrhage						
Triple Therapy	*Routinely*		*Occasionally*		*Never*	
Hypervolemia only	6	15.8%	18	47.4%	0	0.0%
Hypervolemia & Haemodilution (HH)	8	21.1%	16	42.1%	3	7.9%
Hypertension and HH	6	15.8%	17	44.7%	8	21.1%
Nimodipine Therapy	*Intravenously*		*Orally*		*Combined*	
	12	31.6%	16	42.1%	7	18.4%
Anti-fibrinolytic Therapy	*Not Used*		*Routinely*		*As Indicated*	
	26	68.4%	1	2.6%	6	15.8%
_ – Blockade Therapy	*Not Used*		*Routinely*		*As Indicated*	
	10	26.3%	3	7.9%	7	18.4%

of the utilization of hypotension, hypothermia and brain protection strategies. The results of the survey of intraoperative management strategies are summarised in tables 7 to 11.

Table 7: Early and Late Clipping of Aneurysms

	Early < 7 days		*Late*	
	Number	*%*	*Number*	*%*
Anterior Circulation	27	71.1%	10	26.3%
Posterior Circulation	14	36.9%	23	60.6%

Table 8: Temporary Clipping of Aneurysms

Clipping duration (minutes)	*Minimum*	*Maximum*	*Mean*	*Number*
Anterior Circulation	3	20	10	17
Posterior Circulation	3	20	11	12

Table 9: Blood Pressure Control during Aneurysm Surgery

Method	*Number*	*Percentage*
Normotension throughout	18	47.4%
Deliberate Hypotension below 100mmHg	2	5.3%
Hypotension on Aneurysm Rupture only	16	42.1%

Postoperative Management of Intracranial Aneurysm Surgery Patients

Tables 12 and 13 looked at postoperative management issues with the majority of respondents favouring a delayed approach to extubation.

The Management of Traumatic Brain Injury (TBI)

The survey on the management of TBI in particular studied the use of intracranial pressure (ICP) monitoring (Table 14), intubation strategies (Tables 15 and 16), and interventions aimed at the reduction of secondary brain injury. These included targeted hyperventilation that had become unpopular (Tables 17 and 18), and hypothermia (Table 19), that was very much in vogue internationally at the time of the survey.

63.1% still saw a role for Barbiturate coma in the management of refractory ICP elevations. Jugular bulb saturation monitoring (JBSM), that enjoys growing popularity internationally[2], has not made significant inroads into South African practice with only 5.6% of respondents indicating use of this valuable method of monitoring in TBI.

Table 12: Extubation following Aneurysm Surgery

	Number	*Percentage*
"Deep" extubation	7	18.4%
Delayed "Awake" extubation	15	39.5%

Table 13: Postoperative ICU Management

Director of management	*Number*	*Percentage*
Neurosurgeon	18	47.4%
Anaesthesiologist	4	10.5%
Intensivist	3	7.9%
Team approach	16	42.1%

Table 14: Intracranial pressure monitoring in TBI

Measurement	*Number*	*Percentage*
No ICP monitoring utilised	8	21.1%
Intraventicular	12	31.6%
Parenchymal	11	28.9%
Subdural	15	39.5%
Extradural	2	5.3%

Table 15: Oral versus Nasal intubation for Airway Control in TBI

	Number	*Percentage*
Oral intubation	15	39.5%
Nasal intubation	23	60.5%

Table 10: Brain Protective measures during Aneurysm Surgery

	Routinely		*Infrequently*		*Never*	
	No	%	No	%	No	%
Mannitol	28	73.7%	10	26.3%	0	0.0%
Barbiturates	8	21.1%	22	57.9%	8	21.1%
Propofol	4	10.5%	24	63.2%	7	18.4%
	36-37° C		*34-35° C*		*<34° C*	
Hypothermia	13	34.2%	16	42.1%	0	0.0%

Table 11: $PaCO_2$ control during Aneurysm Surgery

Targeted Levels	*3.8 kPa*		*3.9-4.6 kPa*		*>4.6 kPa*	
	8	21.1%	21	55.3%	4	10.5%

Table 16: Glasgow Coma Score (GCS) as indication for intubation - TBI		
	Number	*Percentage*
GCS less than 12**	2	5.3%
GCS less than 11	1	2.6%
GCS less than 10	3	7.9%
GCS less than 9	1	2.6%
GCS less than 8	12	31.6%
GCS less than 7	1	2.6%
***GCS level as determined post-surgically.*		

Table 17: Hyperventilation in TBI		
	Number	*Percentage*
Hyperventilation not utilized	4	10.5%
Routine hyperventilation utilized	8	21.1%
Hyperventilation in targeted cases only	25	67.8%

Neurosurgical Patient Positioning

The final section of the survey focussed on monitoring and positioning of patients for posterior fossa and spinal surgery. Of interest was the fact that in keeping with international trends, the majority of respondents, 63.2%, did not use the sitting position. The breakdown of the usage of the sitting position and related monitoring employed by respondents is depicted in Tables 20 and 21.

The final section of this survey looked at the use of the prone position. Table 22 depicts the use of precautionary measures and monitoring for posterior fossa surgery in the prone position while Table 23 summarises the usage of various devices during prone spinal surgery.

Results of Statistical Analysis of Respondent Data

The secondary objective of the survey had been to determine whether specific factors, including centres for postgraduate train-

Table 20: Sitting position utilization in Neurosurgery		
Procedures performed in sitting position	*Number*	*Percentage*
Cervical foraminotomy / laminectomy	7	18.4%
Pineal region tumour	5	13.2%
Posterior fossa surgery	8	21.1%
Acoustic neuroma	1	2.6%
Other	4	10.6%

Table 21: Monitoring utilization in the Sitting position in Neurosurgery		
Monitoring device	*Number*	*Percentage***
Arterial line	15	93.8%
Multi-orifice central venous line	16	100.0%
Praecordial doppler	9	56.3%
Transoesophageal ecchocardiography	5	31.3%
** Expressed as a percentage of the respondents who completed this section only		

Table 22: Precautionary measures utilized in the prone position**		
Device	*Number*	*Percentage***
Mayfield pins	23	60.5%
Horse shoe	12	31.6%
Gel pads	3	7.9%
Eye lubricants	8	21.1%
** Respondents were free to list, devices not predetermined		
Monitoring utilized in prone position Posterior Fossa surgery		
Monitoring device	*Number*	*Percentage*
Arterial line utilized	36	94.7%
Central venous line utilized	34	89.5%

Table 18: Pa CO2 targets during Hyperventilation in TBI						
	3.8 kPa		*3.9-4.6 kPa*		*>4.6 kPa*	
Routine hyperventilation	6	15.8%	2	5.3%	0	0.0%
	3.8 kPa		*3.9-4.6 kPa*		*>4.6 kPa*	
Targeted hyperventilation	7	18.4%	18	47.4%	0	0.0%

Table 19: Hypothermia in TBI		
	Number	*Percentage*
Hypothermia not utilized	27	71.0%
Routine hypothermia utilized	0	0.0%
Hypothermia utilized infrequently	11	28.9%
Hypothermia temperature targets in TBI		

	36-37° C		*34-35° C*		*>34° C*	
Targeted temperatures	1	2.6%	1	2.6%	8	21.1%*
*21.1% out of total 38 respondents or 72% out of 11 respondents utilizing hypothermia						

Table 23: Positioning devices/techniques utilized in prone position Spinal surgery		
Device	*Number*	*Percentage***
Longitudinal bolsters	4	10.5%
Horizontal bolsters	22	57.9%
Wilson's frame	9	23.7%
Knee-chest position	15	39.5%
Horseshoe ring	15	39.5%
Head turned to the side	17	44.7%
Mayfield pins	4	10.5%

Table 24: Correlation between Respondent Age and Patient Management Strategy	
Management Strategy	*Fischer's Exact Test Pr <= P*
Use of Hypertensive therapy in SAH	0.032
Diagnosis of vasospasm in SAH	0.0008928
Use of ß blockers in Aneurysm surgery	0.0489
Temporary Clipping in Aneurysm surgery	0.0294
CO2 Management in Aneurysm surgery	0.0226
Deliberate Hypotension in Aneurysm surgery	0.0159
ICP monitoring in Traumatic Brain injury	0.0027

Table 25: Correlation between Postgraduate Training Centre and Patient Management strategy	
Management Strategy	*Fischer's Exact Test Pr <= P*
Use of phlebotomy therapy in SAH	0.0493
ICP monitoring in Traumatic Brain injury	0.0109
Barbiturate coma in Traumatic Brain injury	0.0402
Posterior fossa surgery in the Prone position	0.0225
CVP line in the Prone position	0.0134
Arterial line in the Prone position	0.0142

ing, regional factors or the segment in which the respondent practised, namely public or private sector practice, in any way influenced patient management strategies. The analysis revealed several interesting correlations predominantly in relation to age and postgraduate training centre. These are depicted below in Tables 24 and 25 respectively. The authors wish to gratefully acknowledge the Durban Medical Research Council for its assistance with the statistical analysis of the data.

Discussion

Although the relatively low 38% return of completed questionnaires was of concern in terms of the interpretation of statistical data, the sample did contain representation from all the postgraduate Neurosurgical training centres and all the major practice regions in South Africa. Overall practice standards followed international trends with the exception of use of routine hyperventilation in TBI by a significant proportion of the respondents and the fact that Jugular Bulb Saturation monitoring has not made major inroads into South African practice.

The route for placement of CVP's is contrary to British trends3. In South Africa the ante-cubital route was shown to be unpopular whilst the subclavian route is commonly used. Use of CVP's in aneurysm surgery is also higher in South Africa; 97% versus 76% in the UK. The Region in which the respondents practised did not appear to influence management practice to any significant extent although statistical significant correlations were found in relation to ICP and CVP monitoring techniques. Age and the Postgraduate Training centre had a far greater effect on patient management strategies.

Conclusion

Generally management practice standards were found to be in keeping with international trends. The use of routine hyperventilation in TBI ($PaCO_2$ of less than 3.9 kpa without JBSM) by 15.8% is noted with some concern. Regional factors did not appear to influence management practices to any great extent. The analysis of the data supported the view that it was what you were taught at the time of your postgraduate training that was most likely to influence your management strategies. The down side of this finding is that was the older practitioners tend to continue with older and in some cases obsolete techniques practised at the time of their training. They appeared to avoid newer developments in patient management strategy, in some instances to the possible detriment of their patients. This makes a strong case for the need for continuing professional development (CPD) but does not necessarily support the view that CPD in its present form is functioning in South Africa.

References

1. *Kassel NF; J Neurosurgery 1990 73; 37-47;*
2. *De Deyne, C, European Journal of Anaesthesiology 2000; 17 (suppl.19) 43-44.*
3. *Mills SJ; Anesthesia 2001 56;465-469.*