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Pediatric Anesthesia

Blood conservation and pain control in scoliosis corrective surgery: an online survey of UK practice.

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6 **Blood conservation and pain control in scoliosis corrective surgery: an online**
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8 **survey of UK practice.**

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11 **S.Bird¹ and N. McGill¹**

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26 **Background.** Following discussions at national meetings the authors realised the diverse
27
28 range of anaesthetic practice, in paediatric and adolescent scoliosis surgery, current in the U.K.
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30 This coupled with the paucity of research into the peri operative care of the scoliosis patient led
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32 to this national survey. We assessed this diversity using an online survey, with particular
33
34 reference to pain control, thromboprophylaxis and blood conservation strategies. The aim of the
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36 survey was to provoke discussion and highlight areas of future research.
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43 **Methods.** The names of anaesthetists specialised in paediatric and adolescent scoliosis surgery
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45 in the U.K. were collated and contacted via email, asking them if they would fill in a short email
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47 survey. Non responders were contacted a total of three times over a 6 month period. Of the 24
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49 centres practicing paediatric and adolescent scoliosis surgery we received completed
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51 questionnaires from anaesthetists working in 21. A response rate of 88%.
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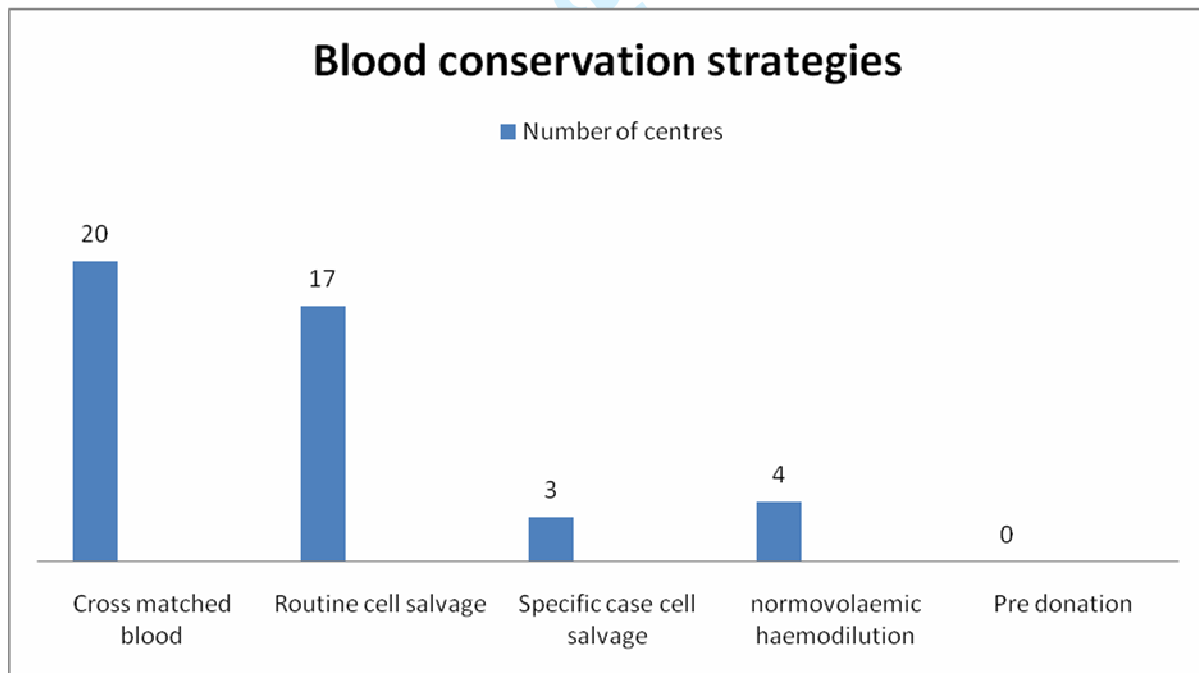
Results.

Blood Conservation

20 centres (95%) routinely cross-match blood. 17 centres (81%) routinely use cell salvage with a further 3 (14%) using it for specific cases. Only 4 centres (19%) advocated normovolaemic haemodilution, with no centres surveyed using pre donated blood. (figure 1)

Peri-operatively, 17 centres (81%) routinely used anti-fibrinolytics, all of whom use Tranexamic Acid. Reported dosing regimens showed an even wider variation than previously reported⁽¹⁾ with loading doses varying between 2-100mg/kg and infusions varying from 3-10mg/kg/hr.

Figure 1. Blood conservation strategies utilized by U.K. centres.

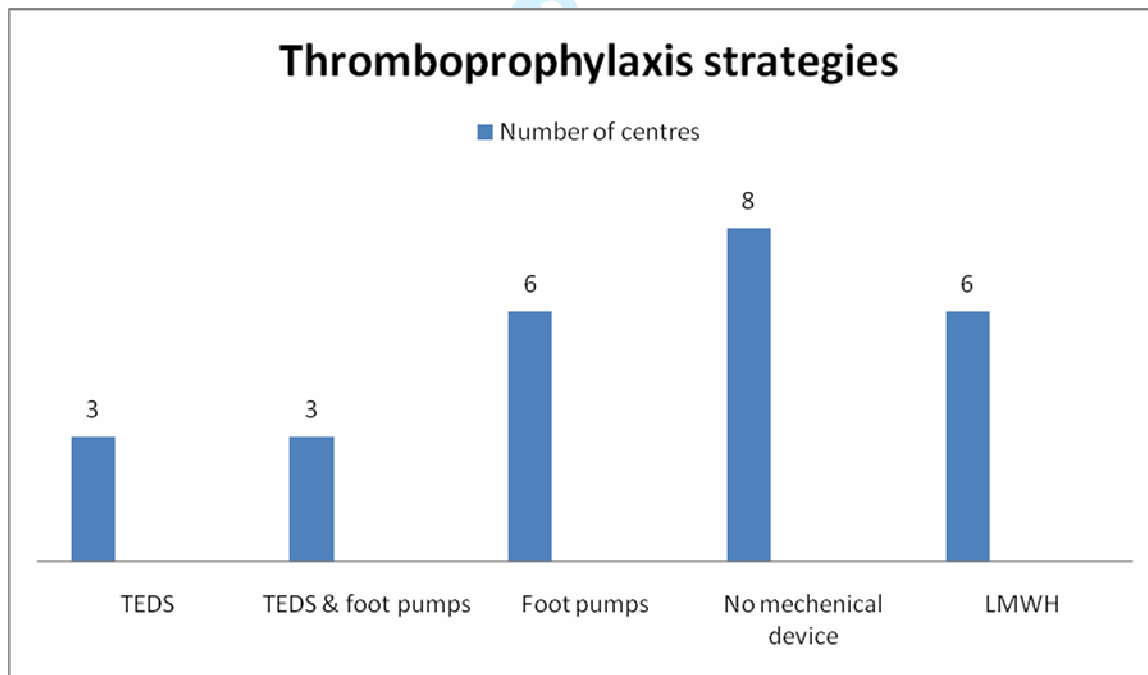


Thromboprophylaxis

Three centres (14%) used graduated compression devices (TEDS) alone, 3 centres (14%) TEDS and foot pumps, 6 centres (29%) foot pumps alone and 8 centres (38%) used no mechanical devices. Low molecular weight heparin (LMWH) was only used as part of a thromboprophylaxis regime in 6 centres (29%) (figure 2)

Those centres that advocated the use of LMWH showed wide variation in timing of therapy; some centers prescribing it the night before, others post operatively on the day of surgery, some 24 hours post surgery and one centre on day 2.

Figure2. Thromboprophylaxis strategies utilized by U.K. centres.



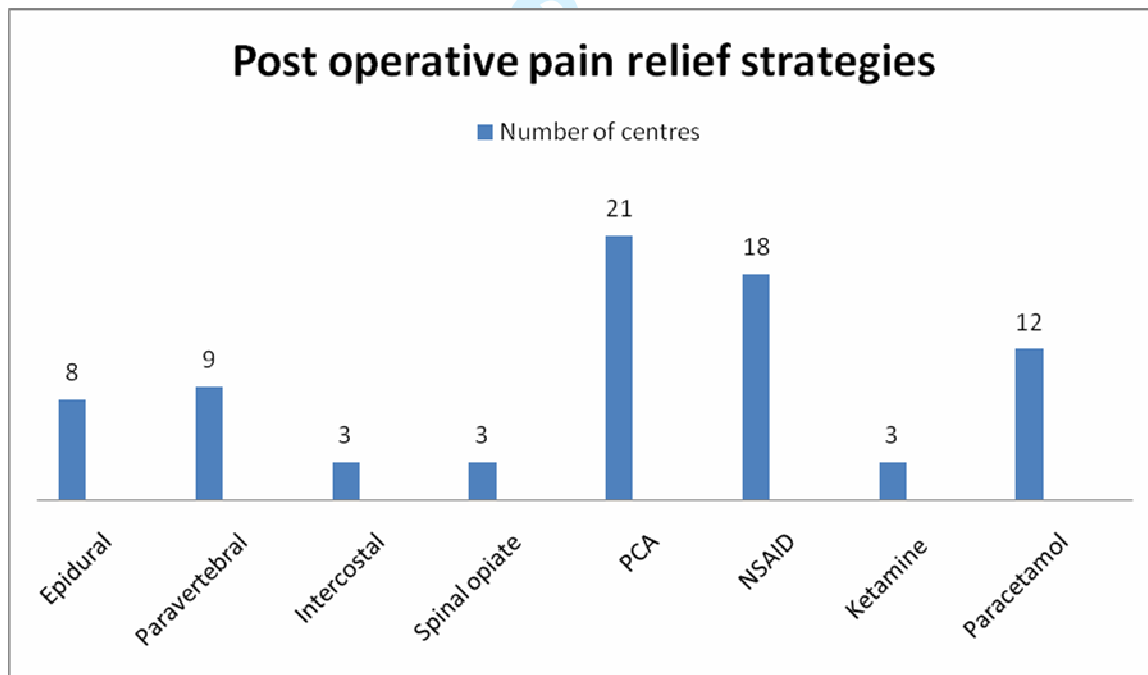
Pain Control

Regional: Epidural analgesia is routinely used in 8 centres (38%), of which 3 centres (14%) place 2 catheters and 2 centres (10%) use patient controlled epidural analgesia, all continue use

into the post operative period. Paravertebral blocks are used in 9 centres (43%), some with postoperative infusions. Three centres each (14%) use intercostal nerve blockade or spinal opioids.

Systemic: All respondents use patient or nurse controlled analgesia (PCA), most commonly morphine but also fentanyl and oxycodone. Ketamine infusions are used in 3 centres (14%). Four centres (19%) use intra operative clonidine as an adjunct. Non steroidal anti inflammatory drugs were avoided by 3 centres (14%). Regular paracetamol was prescribed routinely in 12 centres (57%) and all but 2 (90%) centres use remifentanyl peri-operatively. (Figure 3)

Figure3. Post operative pain relief strategies utilized by U.K. centres.



Institutional factors

The majority of centres have 2-3 scoliosis surgeons (range 1- 5). Of whom most undertake posterior repairs more frequently than either anterior or anterior-posterior combined. There was

1
2
3 considerable spread when looking at total cases undertaken per annum. With 2 centres (10%)
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5 undertaking <25 cases, 7 centres (33%) undertaking 25 - 50 cases, 7 centres (33%) undertaking
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7 50 - 100 cases, 4 centres (19%) undertaking 100 – 200 cases and only one centre (5%) reporting
8
9 over 200 cases a year. There is facility for High care beds (HDU and or ITU) in 90 % of the
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11 centres.
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18 **Preoperative investigation**

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20 Whilst 20 centres (95%) routinely cross-match blood, 14 centres (67%) would order pulmonary
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22 lung function tests, 2 centres (10%) routinely order arterial blood gases and 3 centres (14%)
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24 Echocardiograms with one centre (5%) ordering none of the above.
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29 **Perioperative anaesthetic techniques**

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31 17 centres (81%) utilised hypotensive anaesthesia with 5 of these (29%) defining this as an
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33 active process using a combination of agents including remifentanyl, labetalol, GTN, clonidine
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35 and vapour.
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39 The maintenance agent of choice was divided almost equally between vapour, 9 centres (43%)
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41 and TIVA, 12 centres (57%) techniques.
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44 With regards intra operative monitoring, all centres routinely place arterial lines and 16 centres
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46 (76%) CVP lines. 3 centres (14%) also use oesophageal Doppler and one utilises LiDCO.
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48 For intra operative spinal cord monitoring SSEP was used in 19 centres (90%) although other
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50 monitors are also utilised. BIS or other such devices were used in only 2 centres.
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3 18 centres (86%) extubate their patients in theatre with 2 centres (10%) experiencing respiratory
4 failure, as defined by $\text{PaO}_2 < 8.0$ or $\text{PaCO}_2 > 6.0$, in the first 24 hours in more than 5% of their
5 patients.
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12 **Discussion.** The results from our survey show the expected variation in numbers and types of
13 procedures undertaken across the centres in the U.K. As was expressed in the invitation to
14 undertake the survey our intent was not to promote conformity but to stimulate debate.
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22 **Blood conservation.** The area of greatest clinical variability seen in this survey was the dosing
23 regimens used for Tranexamic Acid. With loading doses varying between 2-100mg/kg and
24 infusions varying from 3-10mg/kg/hr. The Cochrane database review of Antifibrinolytic agents
25 for reducing blood loss in scoliosis surgery in children in 2008⁽²⁾ stated that antifibrinolytic drugs
26 reduced blood loss and the amount of blood transfused. However the fact that only six studies
27 met their inclusion criteria and that no comment on dosing regimens was made shows that there
28 is scope for further research into this area.
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41 **Thromboprophylaxis.** Another area of diversity demonstrated in our survey was that of
42 thromboprophylaxis. Not only was there a broad range of devices used, some in isolation and
43 others in combination, some centres reported not using any mechanical compression pre or post
44 operatively. LMWH were used in only 6 centres and even then showed great variation in their
45 time of administration. The evidence again is sparse and conflicting; a recent study⁽³⁾ looked at
46 adult patients undergoing spinal deformity surgery who all received post operative
47 pharmacological thromboprophylaxis. Here the authors stated an overall incidence of pulmonary
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3 embolism (PE) as 2.4%, with an increased incidence in those patients undergoing anterior spinal
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5 surgery. When comparing their results with an historical control group who had no
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7 thromboprophylaxis they concluded that pharmacological thromboprophylaxis probably doesn't
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9 have a role after posterior spinal surgery but could lower the incidence of PE after anterior spinal
10
11 surgery. A recent pilot ⁽⁴⁾ which screened children for deep vein thrombosis (DVT) after
12
13 posterior spinal fusion for idiopathic scoliosis, looked at 40 patients and demonstrated two
14
15 transient small clots. The authors stated that prophylaxis for venous thrombosis should not be
16
17 recommended. However they added that larger series were required, they did not mention
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19 anterior spinal surgery.
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27 **Pain control.** The frequency and severity of post op pain was not reviewed in this survey,
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29 however the survey showed that eight different types of post operative pain relief were utilised,
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31 some in isolation but many in combination which perhaps is evidence of the potential difficulties
32
33 in treating post operative pain in this cohort of patients. A recent meta-analysis ⁽⁵⁾ looked at the
34
35 evidence to recommend the use of epidural analgesia with parenteral opioids vs intravenous
36
37 opioids only. The authors stated that epidural analgesia is beneficial to patients in terms of
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39 improving pain control and reducing side effects, however there was not enough data available to
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41 state the impact of this technique on respiratory depression, length of stay or mortality. With the
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43 suggestion that these patients may be presenting with chronic pain ⁽⁶⁾ later in life the need for
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45 research into the best perioperative analgesic regime is even more pressing.
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Conclusion

The results from our survey show wide variation in blood conservation, thromboprophylaxis and pain control techniques in scoliosis correction surgery in the U.K. National multi-centered research is required to define best practice.

Key words: Survey, Anaesthetic practice, paediatric, scoliosis surgery, blood loss, pain control

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17 **Appendix A**

18 Hospital taking part in survey, alphabetical order.

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22 Addenbrookes

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25 Alderhey

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27 Birmingham childrens hospital

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29 Freeman hospital, Newcastle

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32 Frenchey

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34 GOS

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37 Guys and St Thomas

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39 James cook hospital, middlesbrough

40
41
42 Leeds general

43
44 Manchester childrens

45
46 Norfolk and Norwich

47
48 North Staffordshire

49
50 Oxford Radcliff & Nuffield orthopaedic

51
52
53 Queens medical centre, Nottingham

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56 Royal Devon and Exeter
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3 Royal national orthopaedic hospital
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5 Royal orthopaedic hospital
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8 Royal Victoria, Belfast
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10 RHSC, Edinburgh
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12 Southampton
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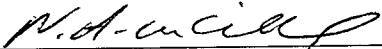
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