



Original article

Tourniquet use during varicose vein surgery: a survey of current practice among Wessex surgeons

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The use of a tourniquet during varicose vein surgery, has been shown, through previous randomised trials, to result in a significant reduction in blood loss, superior post-operative cosmesis with no increase in operating time. Nonetheless, it would seem that few surgeons use this technique. Using postal questionnaires ($n = 107$), we have assessed the views and current practice among general surgeons (consultants and higher surgical trainees) in Wessex where the method was first proposed, to see how widely it has been adopted. We find that the majority (69.5%) of general surgeons in Wessex never use a tourniquet during varicose vein surgery. Possible reasons for this include the belief that it is time consuming, inconvenient, compromises the sterility of the operative field and confers no advantage. We conclude, however, that by not using a tourniquet during varicose vein surgery, surgeons are overlooking an important, evidence-based technique. Given that in the UK over 50,000 patients per year undergo operative varicose vein procedures, this can only adversely affect the delivery of quality healthcare to a large group of patients.

Key words: Varicose veins – Tourniquet

Previous randomised trials of the use of tourniquets during varicose vein surgery, by Corbett *et al*¹ and Thompson *et al*², have shown significant reduction in blood loss, which can amount to 500 ml per leg.¹ Postoperative cosmesis has also been shown to be significantly improved, as judged by an independent

observer and patients themselves. Both studies showed no significant increase in operating time when a tourniquet is used during varicose vein surgery.^{1,2} In addition, the more satisfactory bloodless operating conditions allow easier and more complete avulsion of friable veins. Complications associated with the use of

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Table 1 Frequency of tourniquet use in primary varicose vein operations by subspecialty and grade of surgeon

Frequency of tourniquet use	All surgeons	All consultants	All HSTs	Vascular consultants	Vascular HSTs	Non-vascular consultants	Non-vascular HSTs
Regularly	14 (18%)	7 (16%)	7 (19.5%)	3 (19%)	4 (40%)	4 (15%)	3 (12%)
Occasionally	10 (12.5%)	3 (7%)	7 (19.5%)	2 (12%)	1 (10%)	1 (4%)	6 (23%)
Never	55 (69.5%)	33 (77%)	22 (61%)	11 (69%)	5 (50%)	22 (81%)	17 (65%)
Total	79 (100%)	43 (100%)	36 (100%)	16 (100%)	10 (100%)	27 (100%)	26 (100%)

a tourniquet seem to be infrequent, with none noted by Thompson *et al.*,² in any of the 47 limbs in the tourniquet group they studied. Despite this evidence, few surgeons seem to use this technique. In order to assess both the views and current practice of surgeons in Wessex, where the method was first proposed,³ we conducted a study involving 12 hospitals, to see how far the region has progressed in closing this 'audit loop'.

Methods

Postal questionnaires were sent to consultants and higher surgical trainees (HSTs) in Wessex ($n = 107$), regardless of subspecialty interest. Surgeons were asked whether they used a tourniquet during operations for primary, recurrent varicose veins and for day-case and private patients. The frequency of use was graded as regularly, occasionally and never. Those regularly using a tourniquet were asked what type they used, how long they had undertaken this practice and whether any complications had occurred. Those not using tourniquets were asked, in the form of a closed question, whether they felt that operating time and inconvenience were increased and the sterility of the operative field compromised by the use of a tourniquet. An open question regarding their reasons for non-use was also asked. Finally, we recorded all surgeons' main subspecialty interests.

Results

Of 107 questionnaires sent out (consultants $n = 67$; HSTs $n = 40$), 83 were returned completed, (52 consultants, 31 HSTs). The overall response rate was 78% (83/107), equal for consultants and HSTs. A further 11 (six consultants, five HSTs) out of the 24 non-respondents were randomly interviewed by telephone bringing the overall response rate to 88% (94/107). Fifteen of the 94 surgeons surveyed stated they did not practice varicose vein surgery, and are excluded from the analysis. The study population

comprised 79 respondents, of which 43 were consultants (16 with a vascular interest) and 36 HSTs (10 with a declared vascular interest).

Frequency of tourniquet use

The pattern of tourniquet use was almost identical, regardless of whether surgeons were operating on primary, recurrent or day-case varicose veins. The following figures are, therefore, based on primary varicose vein procedures only. Of the 79 respondents, 69.5% (55/79), stated that they never used a tourniquet. Of those using a tourniquet, 12.5% (10/79) did so occasionally, and 18% (14/79) did so regularly. The main findings are set out in Table 1. Irrespective of subspecialty, 77% (33/43) of consultants, compared to 61% (22/36) of HSTs, never use a tourniquet. Of 41 consultants with a private practice, 78% (32/41) stated they never use a tourniquet whilst operating on private patients.

Among vascular surgeons, 69% (11/16) of vascular consultants and 50% (5/10) of vascular HSTs never use a tourniquet. Conversely, only 19% (3/16) of vascular consultants and 40% (4/10) of vascular HSTs regularly used a tourniquet.

Among non-vascular surgeons, 81% (22/27) of consultants and 65% (17/26) of HSTs never use a tourniquet. Conversely, 15% (4/27) of non-vascular consultants, and only 12% (3/26) of non-vascular HSTs, regularly used a tourniquet. Chi squared analysis of sub groups found no significant differences in practice.

Types of tourniquets in use

Of the 14 respondents regularly using a tourniquet, 11 used a Rhys-Davies cuff and pneumatic tourniquet (although five of these also stated they occasionally used a roll-on cuff). The remaining three used a roll-on inflatable cuff (and one of these also occasionally used an Esmarch bandage and pneumatic tourniquet). Six of the seven consultants within this group, had regularly used a tourniquet for over 5 years.

Complications

Among the 24 regular and occasional tourniquet users, two had recorded a similar complication of a skin burn attributed to contact with a hot autoclaved rubber wedge, as used with a roll-on tourniquet. The remaining 22 reported no complications resulting from tourniquet use, on open questioning.

Views of non-users

Of the respondents who never use a tourniquet, seven felt that using a tourniquet would make no difference to outcome, four felt it would add to the operative time, and three felt it was associated with an increased thrombo-embolic risk (one citing a different surgeon's experience – who was not in the survey – as evidence of this). One cited a previous skin burn, again due to a hot rubber wedge, as the reason for cessation of use.

In addition to the open question regarding their reasons for non-use, we directly asked respondents' views on the potential disadvantages of tourniquet use. Of the respondents who never use a tourniquet, 75% (41/55) completed this part of the questionnaire. When asked whether tourniquet use would increase operative time and inconvenience, and compromise the sterility of the operative field, nearly a quarter answered 'yes' and half answered 'don't know' (Table 2).

Discussion

These findings suggest that only a minority of surgeons currently use a tourniquet during varicose vein surgery in the Wessex region, despite the findings of Thompson *et al* in 1990. In our study, 4 of the 11 telephone respondents (i.e. initial non-respondents), did not practice varicose vein surgery. Of the remaining 7, 1 occasionally used and 6 never used a tourniquet. Given the 12% non-response rate, this would suggest that the final figures in Table 1 may be slightly biased in favour of tourniquet users, i.e. tourniquet use may in fact be even lower than indicated. Since much of the original work on tourniquet use was done in Wessex, we also might expect to find even fewer surgeons outside the region using this technique. In this survey, there was a trend for vascular surgeons, and in particular vascular HSTs, to use a tourniquet, but nevertheless, most vascular surgeons still did not use a tourniquet.

Reasons given for the unpopularity of the method included the belief that it was time consuming. However, consultants did not tend to use tourniquets more frequently for their private patients, and this

Table 2 Perceived effects of tourniquet use among non-users (n = 41)

	Yes	No	Don't know	Total
Increased operative time	9	11	21	41
Increased operative inconvenience?	11	10	20	41
Sterility compromised?	10	9	22	41

would suggest that lack of time was not a factor for the low usage rate. Concern about sterility of the operating field and operative inconvenience were also factors. Only 3 surgeons in the survey, however, used the more modern, convenient, sterile roll-on cuff as their main tourniquet device. Several respondents stated that using a tourniquet would make no difference to outcome, and when non-users were asked their views on the perceived effects – on the operation itself – of using a tourniquet, there were a high proportion of 'don't knows'. This would suggest a lack of familiarity regarding details of the technique of tourniquet use. Finally, despite some respondents' concern regarding the potential for thrombo-embolism, actual complications recorded were few, not life threatening, and entirely avoidable.

Over 50,000 patients in the UK undergo varicose vein procedures each year. It would be reasonable, in view of our findings, to assume that the majority of these are performed without a tourniquet, and that a large group of patients are being denied a better outcome from their operation. Previous studies have reported high rates of minor complications^{4,5} and patient dissatisfaction⁶ following varicose vein surgery. Further studies examining the effect on postoperative discomfort, analgesic requirements and patient satisfaction rates with tourniquet use might yield interesting results, and the authors are currently undertaking a clinical trial to this effect.

Conclusions

In view of their safety and benefits, the importance of evidence-based practice and the implementation of clinical governance, the use of tourniquets during varicose vein surgery should be more widespread. Only when such a change in practice occurs, will this particular 'audit loop' have been closed.

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Cover picture details and key

Vaccination instruments, 1796–1980

Practitioners familiar with deep subcutaneous and intramuscular injection of vaccines may not recall that smallpox vaccine, at the end of its 'career' in 1980, was inoculated intradermally by multiple pressures of a bifurcated needle, without shedding blood.

However, at its birth in 1796, Jenner used a bleeding lancet (see cover of *Annals of The Royal College of Surgeons of England*, July, 1999), based on earlier experience of variolation with actual smallpox virus, and suggested two punctures or scratches not exceeding one eighth part of an inch. Associated bleeding was not uncommon and encouraged by the specific invention of spear-shaped vaccination lancets, also grooved to locate and convey inoculum. By the mid-19th century some questioned whether bleeding was necessary to obtain a satisfactory 'take', and began to use needle-ended vaccinators which aimed to abrade down to the dermis only.

Whatever the precise reasons, the technique of the later 19th century was accompanied by an avalanche of newly invented or modified vaccination instruments. A fairly cursory search of publications and instrument catalogues in Western Europe and America at this time identifies over 45 different instruments, an astounding number for so simple a procedure. Between 1861 and 1906, *The Lancet* alone reported eight new and six modified vaccinators, including one automatic version.

The move away from lancet to needle points was tentative and usually the two were combined, although it was emphasised the lancet point was 'blunt' to avoid bleeding and to use as a vaccine spreader. Weir's Vaccinator, of before 1866, was popular and subsequently appeared under various guises. In the 1880s, sterilisation by flaming discoloured the steel of the period and soon terminations were plated or made of platinum or platino-iridium. The lancet was also perpetuated with ivory points which material was found to absorb vaccine, useful for transportation and later reconstitution with water. Individual ivory points came in packs of upto 100 and became one of the first disposable instruments. The pen-nib type vaccinator was praised, especially in France, for its easy sterilisation by flame and for immediate disposability.

This cover of the *Annals of The Royal College of Surgeons of England* shows three vaccination instruments, two of which became very popular and subjected to 'improvements' (see captions below) whilst the third is mysterious and requires full identification. Readers are invited to say who devised this automatic vaccinator, or provide any information.

Persistent attempts to improve vaccination 'take' in the later 19th century stimulated an eruption of instruments, mostly superfluous to practice. In the 20th century, single needle insertions became generally accepted, perhaps co-inciding with more reliable lymph. Regrettably the fully researched bifurcated needle, delivering an economical dose of vaccine rapidly, appeared very late in the day.

John Kirkup

Captions

From top to bottom

(Top) Cooper Rose's needle pointed vaccinator, the central of five points was said to be longest to act as a pivot whilst the instrument was rotated, hopefully, to remove epidermis only. Some claimed it was difficult to keep the needles clean and introduced minor modifications; it was still advertised in Britain during the 1930s. Nickel-plated, devised 1871, no maker.

(Middle) Padbury's saw-toothed vaccinator also had five points and was rotated, damaging epidermis and dermis; the other extremity mounted a blunt lancet. Its precise origin has not been traced, but it was advertised from 1906 onwards and became the universal vaccinator in India and Pakistan. Stainless steel, circa 1950, maker Holborn.

(Bottom) Automatic vaccinator of unknown origin. A sharp pointed lancet termination is adjusted for depth by screwing the terminal cylindrical cover as desired, the milled handle is pulled back against spring resistance and the trigger is set; the position is shown after firing. Nickel plated, no maker. Further identification invited.

Acknowledgements are made to Derrick Baxby FRCPath for permission to inspect and photograph these instruments.