

TOURNIQUET PRACTICES IN ORTHOPAEDIC SURGERY: A QUESTIONNAIRE BASED STUDY

Muhammad Omar Rathore, Muhammad Suhail Amin*, Muhammad Usman Rathore**

Combined Military Hospital Kohat Pakistan, *Combined Military Hospital Lahore Pakistan, **Combined Military Hospital Bahawalnagar Pakistan

ABSTRACT

Objective: To assess the level of understanding of operation room personnel for application of tourniquets.

Study Design: Descriptive cross-sectional study.

Place and Duration of Study: The study was carried out in the department of Surgery, Combined Military Hospital Rawalpindi, from Feb 2013 to Jun 2013.

Material and Methods: A previously published questionnaire form with slight modifications was distributed among orthopaedic/plastic/general surgery/anaesthesia operation room staff. The questionnaire comprised 26 questions with total of 56 marks. The answers were taken from the individuals on the spot and forms were marked according to the marking scheme and total score of each individual was recorded. The experience of each individual in his respective specialty was also documented (In years). The individuals were categorized into their respective specialties. Data was analyzed using SPSS version 21. Mean and SD of numerical variables was calculated and frequency and percentages were presented for categorical variables.

Results: Fifty six individuals answering all 26 questions from the questionnaire were included in the study. Out of 56 individuals, 6 (11%) were orthopaedic surgeons, 4 (7%) were plastic surgeons, 14 (25%) were general surgeons, 19 (34%) were registrars in surgery, 5 (9%) were registrars in anaesthesia and 8 (14%) were operation room assistants. The mean score of all the participants was 25.1 (\pm 4.1) out of 56 with minimum of 17 to maximum of 35.

Conclusion: The role of tourniquet in the field of orthopaedic surgery has become very significant. As there is no formal teaching to the trainees about its use, there is a need to incorporate its training at the practical level during training.

Keywords: Orthopaedic surgery, Questionnaire, Tourniquet.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

The word "tourniquet" is derived from the French word "tourner" meaning "to turn"¹. These are the devices which are used for stopping the blood flow through a vessel, usually by application of pressure on a limb with the help of a cord, tight bandage or cuff. The initial use of tourniquet found in history was to control bleeding in traumatic limb amputations. Later, it was used more commonly in surgical operations of the limbs as the technological advances were made to improve the design, efficacy and safety of tourniquet².

As operations on limbs are ubiquitous in

the field of orthopaedic surgery, the role of tourniquet in this branch of medicine becomes quite significant. Majority of the operations on limbs in orthopaedic surgery require the use of tourniquet. While, the tourniquet may be a luxury in some limb operations, it becomes a necessity in delicate hand surgeries. The common use of tourniquet renders it to be an important device in orthopaedics. The essential advantage of getting a bloodless surgical field for surgeon does not preclude the complications associated with tourniquet use. It is of utmost importance to use the tourniquet cautiously and carefully to avoid harmful complications due to improper practice^{3,4}.

The significance of thorough understanding of application and indications/contraindications of these devices cannot be overemphasized to

Correspondence: Dr Muhammad Omar Rathore, Surgery Department, CMH Kohat Pakistan

Email: omarrathore@hotmail.com

Received: 19 Aug 2016; revised received: 09 Mar 2017; accepted: 14 Mar 2017

avoid preventable injuries to limb or life^{5,6}. Not with standing above, the operation room staff is usually not educated and trained adequately for its safe use. This is not an appropriate practice, as the operating surgeon is eventually responsible for any untoward consequences associated with the tourniquet use⁷. The aim of this study was to assess the level of understanding of operation room personnel for application of tourniquets.

PATIENTS AND METHODS

The cross-sectional descriptive study was conducted at CMH Rawalpindi from February 2013 to June 2013 by using a previously published questionnaire form with some modifications which were based on guidelines from Association of Peri-Operative Registered Nurses (AORN)^{8,9}. This form was further modified keeping in view our clinical setup. The

registrars and operation room assistants. Exclusion criteria comprised individuals working in operation room and not involved in tourniquet use, individuals not consenting to participate in this study, those who had previously read this questionnaire and senior consultants/Head of Departments. Non probability convenience sampling technique was used. The essence of this study was to assess the baseline knowledge regarding safe tourniquet use. In order to upkeep the originality, the questionnaire form was given to participants in hand by the first author and answers were taken from the individuals on the spot without any consultation from medical literature. The filled questionnaires were marked according to the marking scheme and total score of each individual was recorded. The experience of each individual in his respective specialty was

Table: Means of score and experience of different categories.

Specialty	Number	Mean Score \pm SD (Max Score = 56)	% of Mean Score	Mean Experience \pm SD
Gen Surgeons	14 (25%)	26.7857 \pm 3.33233	47.6%	3.8571 \pm 1.83375
Ortho Surgeons	6 (11%)	27.0000 \pm 6.72309	48.2%	5.8333 \pm 3.76386
Plastic Surgeons	4 (7%)	27.0000 \pm 3.16228	48.2%	2.5000 \pm 0.57735
Registrar Surgery	19 (34%)	24.5263 \pm 3.76192	43.7%	3.3158 \pm 1.29326
Registrar Anaesthesia	5 (9%)	23.6000 \pm 3.71484	42.1%	1.4000 \pm 0.54772
ORA	8 (14%)	22.3750 \pm 2.97309	39.8%	10.0000 \pm 4.07080
Total	56 (100%)	25.1429 \pm 4.10068	44.9%	4.4464 \pm 3.33532

questionnaire included basic questions regarding the principles of applying tourniquet like the optimal overlap, width and site of application on limb. It also encompassed queries relating to various methods of calculation of ideal pressure in tourniquet cuff and adverse effects caused by over-pressurization and prolonged inflation time. Lastly, a few questions pertained to practical aspects about correct method of reapplying tourniquet in case of inappropriate initial site of application and contradictions to tourniquet use. The questionnaire comprised 26 questions with a total of 56 marks. Inclusion criteria comprised individuals involved in tourniquet use and maintenance in the operation room from various specialties including general surgeons, orthopaedic surgeons, plastic surgeons,

also documented (in years).

Data was analyzed using SPSS version 21. Mean and SD of numerical variables such as total score and experience in years was calculated. Frequency and percentages were presented for categorical variables such as categories of specialties.

RESULTS

Fifty six individuals answering all 26 questions from the questionnaire were included in the study. Fifty five individuals (98.2%) were males and one individual (1.8%) was female. Out of 56 individuals, 6 (11%) were orthopaedic surgeons, 4 (7%) were plastic surgeons, 14 (25%) were general surgeons, 19 (34%) were registrars in surgery, 5 (9%) were registrars in anaesthesia

and 8 (14%) were operation room assistants. The mean score of all the participants was 25.1 ± 4.1 with minimum of 17 to maximum of 35. Highest score of 35 was obtained by an orthopaedic surgeon with an experience of 7 years. Also an orthopaedic surgeon having an experience of 12 years obtained the lowest score. The mean of experience of all the individuals was 4.4 ± 3.3 years ranging from 1 to 17 years. The means of score and experience in years of participants in different categories are summarized in table.

DISCUSSION

Tourniquets have been commonly used in the limb operations to acquire a bloodless field. If applied properly, these can be very helpful by reducing the blood loss, making identification of anatomical structures easy resultantly reducing the operation time and thus improving the patient outcome². Improper use of these tourniquets however can result in various complications which adversely affect the patient outcome and add to the patient's morbidity. These complications include local tissue damage secondary to cuff compression, post-operative swelling and wound haematoma with potential subsequent infection, ischaemic injuries, compartment syndrome, vascular injury and tissue necrosis^{10,11}.

The lack of knowledge about proper application of tourniquets, its "do's and don'ts" and its complications can result in unfavourable outcome and may cause medico-legal implications. The purpose of this study was to assess the level of understanding of operation room personnel for application of tourniquets. The mean score of all participants was 44.9% (25.1) in our study. In a similar study conducted by Daruwalla et al⁸, their mean score was 30.9%. Category wise, the highest mean score was obtained by specialists in our study including orthopaedic surgeons and plastic surgeons, and lowest score was achieved by operation room assistants (table). In Daruwalla et al, the highest mean score was present in nursing group (38.8%) followed by specialist registrars (36.1%) and

lowest in porters (11.9%). In a study by Sadri et al¹², the mean score of specialist registrars was 41.3% whereas it was 36.1% for specialist registrars in Daruwalla et al and 43.5% in our study (Registrar surgery and anaesthesia combined). In Sadri et al, the mean score of operation room assistants was 46.75 and in our study it was 22.3 (39.8%). The mean score of different groups in our study are much better than Daruwalla et al and comparable to that of Sadri et al. There are slight differences in the questionnaires used in each of the above mentioned studies as modifications were made according to the practices being followed in their respective local set up. Another important fact that needs to be mentioned here is that this questionnaire form has not yet been validated for assessing the level of competence of an individual regarding tourniquet use⁸. But as this questionnaire is derived from the AORN guidelines and the questions asked are practical, relevant and clinically oriented, it is still an effective method of assessing the practical knowledge and it gives a fair image of level of understanding.

Our study reveals that as a category, the score is directly related to the professional status as the specialists have the highest score followed by registrars and then operation room assistants. There is no relationship between experience in years and the score achieved as operation room assistants being most experienced in terms of years (Average 10 years) obtained lowest mean score. The variation of score between individuals and between different categories of medical staff highlights the importance of application of a standardized teaching protocol regarding tourniquet. Currently, there is no formal mechanism of teaching this technique to the students/trainees practically and also there is no mention of it in the syllabi. The knowledge is passed from seniors to juniors in the operation rooms while using tourniquets informally. Keeping in view the benefits of its proper use and complications that can be caused by improper use of tourniquets, it is important that

proper guidelines and protocols need to be set up at the institutional level for the practical teaching of this technique and addition of this subject in the syllabus as well.

CONCLUSION

The role of tourniquet in the field of orthopaedic surgery has become very significant. It has many benefits if used properly, however, lack of knowledge about its proper use can result in serious complications resulting in untoward outcome. As there is no formal teaching about its use, there is a need to add its training at the practical level as well as addition of this subject in the syllabus to create awareness among surgical staff about its proper and correct use.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

REFERENCES

1. Sharma JP, Salhotra R. Tourniquets in orthopedic surgery. *Indian J Orthop* 2012; 46: 377-83.
2. Klenerman L, editor. *The Tourniquet Manual: Principles and Practice*. Springer-Verlag London Limited; 2003.
3. Olivecrona C, Blomfeldt R, Ponzer S, Stanford BR, Nilsson BY. Tourniquet cuff pressure and nerve injury in knee arthroplasty in a bloodless field. *Acta Orthop* 2013; 2(84): 159-64.
4. Fitzgibbons PG, DiGiovanni C, Hares S, Akelman E. Safe tourniquet use: A review of the evidence. *Journal of the American Academy of Orthopaedic Surgeons* 2012; 20(5): 310-19.
5. Deloughry JL, Griffiths R. Arterial tourniquets. *Contin Educ Anaesth Crit Care Pain* 2009; 9(2): 56-60.
6. Odinson A, Finsen V. Tourniquet use and its complications in Norway. *J BoneJoint Surg Br* 2006; 88: 1090-2.
7. Murphy CG, Winter DC, Bouchier-Hayes DJ. Tourniquet injuries: pathogenesis and modalities for attenuation. *Acta Orthop Belg* 2005; 71: 635-45.
8. Daruwalla ZJ, Rowan F, Finnegan M, Fennell J, Neligan M. Exsanguinators and tourniquets: Do we need to change our practice? *Surgeon* 2012; 10: 137-42.
9. AORN Committee. Recommended practices for the use of the pneumatic tourniquet in the perioperative practice setting. *AORN J* 2007; 86: 640-55.
10. Cunningham L, McCarthy T, O'Byrne J. A survey of upper and lower limb tourniquet use among Irish orthopaedic surgeons. *Ir J Med Sci* 2013 Sep; 182(3): 325-30.
11. Esteb JP, Davies JM, Richebe P. The pneumatic tourniquet: mechanical, ischaemia-reperfusion and systemic effects. *Eur J Anaesthesiol* 2011; 28: 404-11.
12. Sadri A, Braithwaite IJ, Abdul-Jabar HB, Sarraf KM. Understanding of intra-operative tourniquets amongst orthopaedic surgeons and theatre staff - a questionnaire study. *Ann R Coll Surg Engl* 2010; 92: 243-5.