International Journal of Surgery Case Reports 90 (2022) 106402

Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.elsevier.com/locate/ijscr

Letter to the editor

Preventing the complications of forgotten tourniquet by using intelligent tourniquet: A letter to the editor

Dear editor,

Jean Louis Petit (1718) was the inventor of a screw-type tourniquet and the first person who used the term tourniquet, derived from the French word tourner. His invention was a screw-type tourniquet consisting of a strip and a screw made of wood [1]. The next type of tourniquet was the rubber band developed and introduced by Johannes Friedrich August von Esmarch (1873), professor of surgery at the University of Kiel [2]. Concerning the possible neuroleptic effects of the Esmarch bandage, Harvey Cushing (1904) invented his sphygmomanometer-inspired device called pneumatic tourniquet [3]. There are generally two types of tourniquets; surgery and emergency. Surgery tourniquets are used in orthopedic and plastic surgery to provide a bloodless environment, higher safety, more accuracy, and the surgeon's comfort. Emergency tourniquets are used to control bleeding in accidents or war [4]. Complications of the prolonged application of a tourniquet include pain caused by mechanical stress and the mechanism of ischemia-reperfusion. The central nervous system can also have a role in causing this complication [5]. Post-tourniquet syndrome, which occurs two to 4 h after using the tourniquet, is a common reaction to prolonged ischemia during which muscle stiffness and weakness, paleness, joint stiffness, and tingling sensation are experienced by the patient [6]. Pulmonary embolism, venostasis-related deep vein thrombosis, endothelial damage, and platelet aggregation are other complications of prolonged placement of tourniquet [2]. The prolonged placement of the tourniquet also causes homeostasis, acidosis, and hypoxia in tissues close to the site tourniquet placed on [7]. Due to the tourniquet-related local pressure, a regional nerve blockade could be formed in the nerves under pressure and cause mechanical deformation of the nerve and nerve paralysis in the area on which the tourniquet applied. Surgical tourniquets are commonly used in surgical procedures to reduce bleeding from the surgical site, and this type of tourniquet is recommended to be used for 1 to 4 h to minimize its complications [8]. Concerning the above complications of conventional tourniquets (Fig. 1) and the frequent use of them by nurses in procedures such as IV insertion and venipuncture, after which the tourniquet may be forgotten to be opened due to nurses' exhaustion and heavy workload, the tissue blood flow reduces after about 4 h. Eventually, it leads to the tissue ischemia and necrosis. This issue could be even worse when the patient is not conscious enough to open the tourniquet. Therefore, we decided to suggest a tourniquet device that will alarm after 5 min. Moreover, if the tourniquet does not open, it will be unlocked automatically to prevent complications such as limb necrosis.

The recommended tourniquet has the following specifications:

1. It has an elastic tie like other tourniquets.
2. It has an electronic head that has the following specifications:
   - The lock section has an alarm, and it sounds after 5 min (of course, this time is adjustable)
   - The lock is automatic and has a timer as it opens after 6 min (or set time).
   - The lock has ON and OFF buttons.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Funding

This letter to editor did not receive any specific grant from fund-ing agencies in the public, commercial, or not-for-profit sectors.

https://doi.org/10.1016/j.ijscr.2021.106402
Received 30 August 2021; Accepted 10 September 2021
Available online 13 September 2021

Fig. 1. Conventional tourniquets used for venipuncture.

Ethical approval

None. Our paper is in the format of letter to editor.

Consent

None. Our paper is in the format of letter to editor.

Author contribution

Naser parizad: Reviewed the literature and wrote the manuscript.
Rasoul Goli & Amireh Hassanpour: Supervised the writing process and revised the manuscript.

Registration of research studies

Not applicable.

Guarantor

Rasoul Goli.

Declaration of competing interest

None.

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