UNIVERSITI PUTRA MALAYSIA

PROGRAMMABLE MULTI-BLADDER PNEUMATIC TOURNIQUET CUFF

AMIR MOHAMMAD EBRAHIMI TAJADDOD

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PROGRAMMABLE MULTI-BLADDER PNEUMATIC TOURNIQUET CUFF

By

AMIR MOHAMMAD EBRHIMI TAJADDOD

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June 2012
To my beloved family
Father and Mother
PROGRAMMABLE MULTI-BLADDER PNEUMATIC TOURNIQUET CUFF

By

AMIR MOHAMMAD EBRAHIMI TAJADDOD

June 2012

Chairman: Assoc. Prof. Abdul Rahman bin Ramli, PhD

Faculty: Institute of Advanced Technology

Pneumatic Tourniquet cuff device is used in limb orthopedic surgery especially in the upper limb to provide a bloodless field it can be obscured by blood. The tourniquet cuff occludes both venous and arterial supply. In the process there is also compression of the nerve and this can result in pneumatic tourniquet cuff system paralysis. When the operation is done under regional or local anesthesia the patient may experience discomfort at the site of application. This shortens the duration of the pain tolerance and hence lengthy operation can not be carried out under local or regional anesthesia. Since many operations may be carried out under local or regional anesthesia, a pneumatic tourniquet cuff system had been designed which may help to increase the pain tolerance. The multicompartent pneumatic tourniquet cuff system with multiple bladders each with its own pumps to inflate and deflate each tourniquet cuff is implemented to produce a bloodless field. A microcontroller controls each tourniquet cuff to be inflated and deflated. The pressure effect on the
underlying structures is then reduced while maintaining a bloodless field. This tourniquet cuff system comprises of pump unit, microcontroller and a cuff with three compartments. The pump unit is AC powered operates to inflate at a preset pressure. There is a valve and a pressure transducer which is responsible to maintain the pressure at a preset level. Depending on the signal received from the microcontroller the sequence of open and close the three valves are regulated. The tourniquet had 3 compartments non-structuring fabric is used to form the three compartments into 3 bladders are inserted. The bladder is a sealed bladder with only inlet or outlet which is provided by the tubing. The operation of the system is controlled by a microcontroller. This unit is turned on and the pressure required is set. The inflate button is turned on. Based on the programming done the inflation of the proximal tourniquet followed by the middle and distal tourniquet is done followed by the reverse sequence, thus maintaining the occlusion to provide a bloodless field but relieving pressure at the site of the tourniquet. Hence reducing the discomfort and relieving the pressure on the underlying structures especially the nerve.
Alat manset penasak darah berisi udara digunakan dalam pembedahan ortopedi lengan terutamanya dalam lengan atas ke kawasan tidak berdarah untuk menggambarkan struktur minit yang digelapkan oleh darah. Manset penasak darah ini menutup jalan kedua-dua pembekalan vena dan arteri. Dalam process ini terdapat juga kemampatan urat saraf dan ini boleh mengakibatkan kelumpuhan sistem manset berisi udara. Semasa pembedahan ini dijalankan dalam keadaan pembiusan kedaerahan atau setempat pesakit mungkin mengalami ketidakselesaan pada sisi pemakaian. Ini memendekkan jangka masa kesabaran sakit dan oleh kerana itu banyak pembedahan tidak dapat dijalankan dalam keadaan pembiusan kedaerahan atau setempat. Oleh sebab banyak pembedahan mungkin dijalankan dalam keadaan pembiusan kedaerahan atau setempat, sistem manset penasak darah berisi udara yang
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I certify that an Examination Committee has met on (.........) to conduct the final examination of Amir Mohammad Ebrahimi Tajaddod on his Master of Science thesis entitled “Programmable Pneumatic Tourniquet Cuff” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the student be awarded the Master of Science degree.

Members of the Examination Committee were as follows:

Azmi bin Zakaria, PhD
Professor
Faculty of Science
Universiti Putra Malaysia
(Chairman)

M. Iqbal bin Saripan, PhD
Associate Professor
Faculty of Engineering
Universiti Putra Malaysia
(Internal Examiner)

Syamsiah binti Mashohor, PhD
Senior Lecturer
Faculty of Engineering
Universiti Putra Malaysia
(Internal Examiner)

Mohd Alauddin Mohd Ali, PhD
Professor
Faculty of Engineering
Universiti Kebangsaan Malaysia
(External Examiner)

SEOW HENG FONG, PhD
Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:
This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

**Abdul Rahman bin Ramli, PhD**  
Associate Professor  
Institute of Advance Technology  
Universiti Putra Malaysia  
(Chairman)

**Manohar Arumugam**  
Associate Professor  
Faculty of Medicine  
Universiti Putra Malaysia  
(Member)

---

**BUJANG BIN KIM HUAT, PhD**  
Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date:
DECLARATION

I declare that the thesis is my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at University Putra Malaysia or at any other institutions.

______________________________
AMIR M.E.TJADDOD

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