

# Intraoperative Protection by Position Limiting Device in General and Orthopedic Surgery Application

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## Abstract

Intraoperative protection using a surgical position limiting device is becoming increasingly significant in both general and orthopedic surgeries. The utility model provides a surgical position limiting device comprising a restraint belt, wherein the restraint belt is connected with an elbow pocket. A space is arranged in the elbow pocket. A cushion is arranged in the elbow pocket, and a groove is arranged in the cushion for accommodating the elbow. The elbow pocket and groove are L-shaped as a whole; The head of the operating bed or the side of the bed body is provided with a restraint band fixing piece, and the restraint band is connected to the operating bed through the restraint band fixing piece. The utility model aims to provide a surgical position limiting device, which is suitable for restraining the upper limb of the patient during the operation, especially for the operation of the abdomen, pelvis and acetabulum, which can stably restrain the upper limb, avoid the loosening of the upper limb of the patient, protect the elbow joint of the patient, and prevent the compression injury of the radial nerve and ulnar nerve. It has the advantages of firm and reliable fixation, convenient use and simple structure for the clinical applications.

**Keywords:** Intraoperative protection; Surgical position Limiting device; Elbow pocket; Clinical application.

## Introduction

When performing abdominal and pelvic and acetabular surgery in orthopedics and general surgery, in order to expose the abdomen for convenient operation [1-4], it is usually necessary to restrain one side of the patient's upper limb from the position of bending the elbow against the chest for two reasons: First, if both sides of the upper limbs are placed with straight abduction, bilateral hand rests need to be placed, and the patient's bilateral upper limbs stretch out to occupy valuable space in the operating room, and the activities of medical staff will be limited. Second,

the patient's position cannot be changed during the operation, which will cause some operations to be impossible [5-8].

At present, in order to effectively restrain the patient's arm, the patient's upper limb is usually flexion at the elbow with transverse restraint straps [9-12]. This method requires binding around the front of the patient's body and under the operating bed. The operation is timeconsuming. The long-term fixation with the restraint band is easy to cause local skin pressure injury and to increase the risk of radial nerve and ulnar nerve compression injury [13,14]. In addition, the lower edge of the hospital coat can

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also be reversed to press on one side of the patient's upper limb, which is not firmly fixed in this method, and the patient's hand is easy to slide and shift, affecting the implementation of surgical operations. Considering these factors, we assume it is vital to make some adjustment on the surgical limiting device.

### **Application method**

A surgical position limiting device comprises a restraint belt, wherein the restraint belt is connected with an elbow pocket, and a space is arranged in the elbow pocket, wherein a pad is arranged, and a groove is arranged in the pad to accommodate the elbow, wherein the elbow pocket and groove are L-shaped as a whole; The head of the operating bed or the side of the bed body is provided with a restraint band fastener, and the restraint band is connected to the operating bed through the restraint band fastener. The technical scheme designs a special surgical position limiting device, which includes a restraint strap and elbow pocket, and a special pad corresponding to the patient's elbow is set in the elbow pocket to protect the patient's elbow joint. When used, the elbow pocket and the inner pad directly cover the patient's elbow joint, so that the patient's forearm and elbow are attached to the chest and in a bent elbow position. The pads play the role of padding and cushioning pads, and distribute the force evenly to avoid local concentration of force when binding the restraint belt; The restraint belt and elbow pocket constitute the structure of the upper limb of the patient to prevent the forearm from protruding during fixation. The restraint belt is fixed with the operating bed through the restraint belt fixing piece, and the position of the surgical position limiting device relative to the operating bed can be realized, and the displacement of the surgical position limiting device and the patient's upper limb relative to the operating bed can be further avoided, so as to avoid interference with the operation.

The restraint band is inclined, and the inner Angle  $\alpha$  between the long side of the restraint band and the side of the surgical head is  $35^\circ$  to  $55^\circ$ , which further improves the stability of the restraint. At the same time, it is vital to avoid the restraint band pressing on the patient's head to improve patient comfort.

The restraint belt fastener is connected with the bedside or the side of the bed body of the operating bed through the guide slide device, which can be moved along the bedside or the side of the bed body, and the position of the strap fastener can be adjusted according to needs, so as to be more flexible in use; The slide block is provided with a locking device for fixing the position of the slide block, and the guide slide block device and the slide block locking device in the prior art can be adopted.

The restraint belt comprises two, respectively connected to both ends of the elbow pocket, to further improve the stability of the restraint, and the two restraint belts evenly distribute the force to avoid the local force concentration when the restraint belt is fastened.

The restraint belt is fixedly connected with the restraint belt fixing part, and the restraint belt is provided with a belt buckle for adjusting the length of the restraint belt. The belt buckle makes the restraint belt connection more stable and avoids loosening of the upper limb; By adjusting the length of the restraint belt through the buckle, the tightness can be adjusted according to

the specific needs of the use of different types of patients.

The pad is made of silicone or sponge, and is provided with an internal gap to ensure air permeability, which can fully cover the middle and upper third of the patient's upper arm to the wrist. The pad is made of silicone or sponge, and can fully cover the elbow of the patient. The pad plays a role in protecting and cushioning pressure, and helps to protect the nerve of the patient's elbow. It further improves stability and avoids hand loosening.

### **Result and discussion**

In view of this, the utility model aims to provide a surgical position limiting device, which is suitable for restraint during surgery. The upper limb of the patient, especially suitable for the operation of the abdomen and pelvis and acetabular parts, can stably restrain the upper limb, avoid the occurrence of the patient's upper limb loosening, and can protect the patient's elbow joint, ulnar nerve and radial nerve, with the advantages of firm and reliable fixation, easy use and simple structure.

In order to achieve the above purposes, the technical scheme of the utility model is realized as follows: A surgical position limiting device comprises a restraint belt, wherein the restraint belt is connected with an elbow pocket, a space is arranged in the elbow pocket, a cushion is arranged in the elbow pocket, a groove is arranged in the cushion for accommodating the elbow, and the elbow pocket and groove are overall L-shaped; The head of the operating bed or the side of the bed body is provided with a restraint band fixing piece, and the restraint band is connected to the operating bed through the restraint band fixing piece. The restraint band is inclined, and the inner Angle between the long side of the restraint band and the side of the surgical head is  $35^\circ$  to  $55^\circ$ . The restraint band fastener is connected to the head of the operating bed or the side of the bed body through a guide slide device. It can be moved along the head or side of the bed, and respectively connects to both ends of the elbow pocket. The restraint belt is fixedly connected to the restraint belt fastener, and the restraint belt is provided for adjusting the restraint Belt buckle with length. The pad is made of silicone or sponge, and is provided with an internal gap to ensure air permeability, which can fully cover the middle and upper third of the patient's upper arm to the wrist.

Compared with the prior art, the surgical position limiting device of the utility model has the following advantages: The utility model can effectively maintain and limit the position of the upper limb of the patient, avoid interference with the operation, improve the comfort of the patient and improve the work efficiency of the doctor, and has practicability. The technical scheme solves the problem that the upper limb of the patient is not easy to be fixed in the chest position by bending the elbow and is easy to be loosened during the operation, which causes interference to the operation. At the same time, the risk of local skin pressure injury and radial nerve and ulnar nerve injury easily caused by long-term fixation is avoided.

### **Conclusion**

In conclusion, the surgical position limiting device has the advantages of good protection of the patient, wide application, high safety, and good feasibility. It deserves the application in the general and orthopedic surgery for further clinical evaluation.

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## Declarations

**Conflict of interest:** There are no conflicts of interest.

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**Authors contribution:** Qing Chen is responsible for manuscript drafting and data evaluation. Yiqian Ni is responsible for revision and submission.

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