

Corpora cavernosa as an alternative route for transfusion

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1. ABSTRACT

Routine intravenous blood transfusion is difficult when the blood pressure falls significantly or veins are inaccessible or are sclerotic due to multiple transfusions. Here, we describe the use of penile corpora cavernosa (CC), as an alternative route for blood transfusion and fluid replacement. The study was conducted in 15 men, 7 with massive burns, 6 with sclerotic veins from repeated injections, and 2 with extensive limb trauma. After the conventional methods of blood and fluid infusions were exhausted, a needle was inserted into CC for blood and fluid administration. During blood or saline infusions, penile shaft became elongated but retruned to a normal length after termination of the infusion. There were no difficulties during needle insertion into CC, in varying the different transfusion rates, or in repetition of transfusion during the same or the subsequent days. Complications were rare with the exception of a subcutaneous penile hematoma in 2 patients which disappeared spontaneously. Erection was not disturbed in five patients who were followed for a mean of 10.4±1.8 months. These findings show that corpora cavernosa can be used for blood transfusion or for administration of fluids as a simple, easy, rapid, and safe vascular access in conditions in which conventional routes are inaccessible.

2. INTRODUCTION

Richard Lower demonstrated the feasibility of transfusing blood from one animal to another in 1665 (1). Sheep blood was successfully transfused to two individuals by Jean Baptiste Denis and Emmerez in (1). Due to the death of one recipient, the practice was banned. It was not until 1818 that James Blundell of St Thomas and Guy's hospital performed the first man-to-man transfusion (2). Since then, blood transfusion is performed in many life threatening and other medical conditions.

The major indications for blood transfusion are the restoration of the blood volume and/or the improvement of the blood oxygen-carrying capacity. Infusion of IV fluid may be carried out in emergencies until blood for transfusion is prepared. However, peripheral venous cannulation through a percutaneous puncture may prove difficult, if not impossible, when the blood pressure drops dramatically due to massive burns, shock or obesity. Furthermore, in longstanding use of venous infusions and multiple venous punctures, vein sclerosis occurs, which hampers vein cannulation. In such conditions, the alternative method is to use jugular or femoral veins, the venous cut down, or deliver blood by intraosseous route (3, 4). However, these methods may be time-consuming and technically demanding.

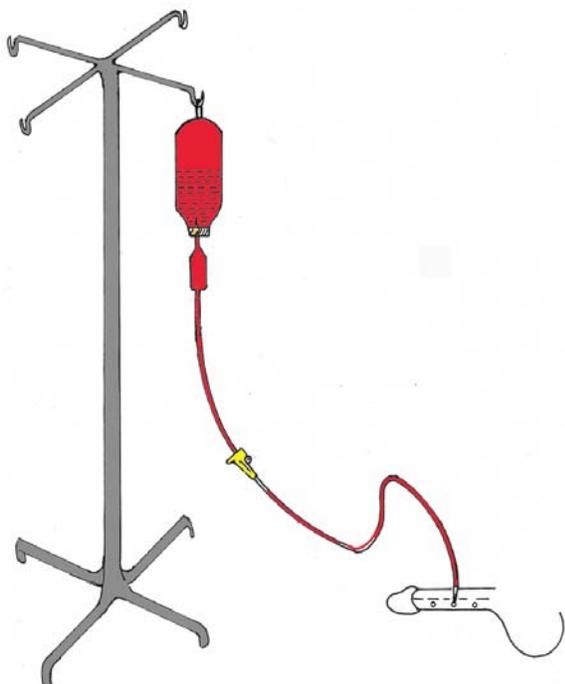


Figure 1. Diagrammatic representation for intracavernosal infusion. The site of injection are circled on the shaft.

The penile corpora cavernosa (CC) consists of sinusoidal spaces surrounded by smooth muscle fibers (SMFs) (5, 6). In the flaccid state, the SMFs are contracting and the sinusoids are either empty or contain a small amount of blood. On erection, the sinusoids dilate and fill with blood due to perisinusoidal muscle relaxation (7). These sinusoidal spaces accommodate large amounts of normal saline infused for cavernosometry as well as of vasoactive drugs for the diagnosis and treatment of erectile dysfunction (ED) (8,9). Furthermore, cavernosography is performed by injecting a radio-opaque dye into the CC (10). In view of the commonly practiced injection of different types of fluids into the CC with negligible complications, we hypothesized that blood transfusion and fluid replacement therapy would be feasible intracavernously. This hypothesis was investigated in the current study.

3. MATERIAL and METHODS

3.1. Subjects

The study was comprised of 15 male patients with a mean age of 39.6 ± 10.25 SD (range 26-52). Seven patients had second and third degree burns involving 35-40% of the trunk, neck and both limbs. Six patients had recurrent colorectal cancer and had sclerotic veins from repeated venous punctures. The other 2 patients had extensive limb trauma. Due to difficulty in accessing veins, the fluid and/or blood were administered by intracavernosal route in these patients. The study was approved by the Cairo University Faculty of Medicine Review Board and Ethics Committee and consents were obtained from all patients participating in this study.

4. RESULTS AND DISCUSSION

There are various routes for IV infusion of fluids and blood transfusion (3,4). The commonly used route is the intravenous, however, the veins may be collapsed during shock or may be sclerosed from repeated infusions. Other routes such as the use of jugular or femoral veins, the venous cut-down or the intraosseous route may be technically difficult and time consuming (3,4). In the current study, we used a novel route through the CC for IV administration of fluid or blood when the other routes were not suitable.

The penile shaft consists of 2 CCs and one corpus spongiosum. The CCs consist of sinusoids surrounded by smooth muscle fibers. The sinusoids are either empty or contain a small quantity of blood when the penis is flaccid (5,6). The fluids injected into the CC pass uninterruptedly through the cavernosal tissue to the circulation. The sinusoidal pattern of the CC acts as an IV channel which can effectively transfer fluids from the penis to the circulation. As the intercavernosal septum is incomplete, the fluids injected into one CC presumably pass to the other one so that the fluid is distributed equally through the 2 CCs (5,6). The intercavernosal communication allows for injection into either of the 2 CCs. Furthermore, the length of the CC and the presence of 2 CCs increase the surface area for repeated injections at different sites in the CC.

During the procedure, an 18-gauge intravenous cannula was inserted into the shaft of the penis and blood was withdrawn, to verify that the needle was in a sinusoid. The relatively thick and fibrous tunica albuginea surrounding the CC maintained the cannula at its site during the period of blood or fluid infusions. In the shock states, it took only few seconds to insert the cannula into the CC. This is in contrast to the time needed to establish a femoral access or saphenous cut down which requires a mean of 3.18 to 5.63 minutes (15). Unlike the other routes of intravenous infusions in which the veins are collapsed in shock or sclerosed from repeated injections difficulties were not encountered for insertion of the needle into CC. Furthermore, failure to introduce the cannula into the CC in the frequent sessions was not encountered in any patient. During the procedure, the bag of blood or fluid was suspended on a stand, one meter above the abdomen (Figure 1). The rate of blood transfusion was adjusted from 30 to 65 ml/min according to the blood pressure and the amount of blood loss. The intracavernosal route (ICR) of blood transfusion was used 1-4 times daily. The site of needle insertion into the CC was changed at each transfusion. The needle was introduced into the penis at the root, or in the mid-shaft, or 1-1.5 cm proximal to the corona (Figure 1). Each injection was performed on one side of CC at a time, leaving the contralateral side for subsequent transfusion. To prevent hematoma, following termination of the blood transfusion and withdrawal of the needle, the penile shaft at the site of needle insertion was compressed between fingers for 1-2 minutes. The CC infusion was used during the shock for 1-6 days (mean 2.4 ± 1.1). In the patients with sclerosed veins, fluid administration by the ICR was used for a longer period (mean 16.4 ± 7.3 SD days).

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Side effects were not encountered during or after performing the ICR. Subcutaneous penile hematoma occurred in 2 patients but disappeared spontaneously. CC scarring or priapism did not occur in any patient. During infusion of blood or normal saline, the penile shaft showed elongation which disappeared after termination of infusion. No difficulties were encountered by varying rates of IC infusion from slow to rapid or repeating the infusion during the same or subsequent days.

In cases of erectile dysfunction, intracorporal injections of fluids and drugs are used for both diagnostic and therapeutic purposes (7-10). The CC communicates freely with the circulation through the penile vein (11). Although IC injections are performed for over long periods, significant penile complications are rare (12-14). In this study, the erection status was followed in 5 men for mean period of 6.3 ± 1.4 SD months (range 4-8) after discharge from the hospital. These patients had normal sexual activity after ICRs. Change in the penile shaft in the flaccid state or during erection, swellings or curvatures or pain or discomfort during erection or coitus were not observed after ICRs. Fibrosis of corpus cavernosum or priapism which might occur after repeated injection did not occur, likely due to the short period of injections.

In conclusion, the CC can serve as a simple, easy, rapid, and safe method for vascular access in conditions for administration of fluid or blood when other conventional routes are inaccessible.

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