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Ideas and Innovations

Inflatable trays for the prevention of contamination in surgery

J.R.W. Hardy[a,*], A.W. McCaskie[b], S.J. Calder[c], G.T.R. Pattison[a]

[a]*Department of Orthopaedic Surgery, University of Bristol, Avon Orthopaedic Centre, Southmead Hospital, Bristol, BS10 5NB, UK*
[b]*Department of Trauma and Orthopaedic Surgery, Medical School, University of Newcastle, Newcastle upon Tyne, NET 4HH, UK*
[c]*Department of Trauma and Orthopaedic Surgery, St James's University Hospital, Beckett Street, Leeds LS9 7TF, UK*

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1. Introduction

Tissue debridement, irrigation with copious amounts of normal saline (2–10 l) followed by fracture fixation is the standard treatment for open fractures of the lower limb [1]. The irrigation fluid and blood have traditionally been collected in a kidney dish and removed via a suction catheter. The patient, drapes, operating table, floor and, most importantly, the surgical and nursing staff are often, by the end of the procedure, soaked. It is increasingly realised that this practice carries an unacceptable risk of cross-infection of theatre staff from blood-contaminated irrigation fluid [2].

Clinical suspicion of transmissible disease [3] and testing alone are ineffective means of identifying high risk patients and all possible precautions should be taken to reduce exposure to potentially infectious body fluids in every case [4,5]. In this way it is possible to reduce the cumulative risks of cross infection with blood borne pathogens.

Particular concern has been raised regarding the transmission of Human Immunodeficiency Virus (HIV) and Hepatitis C virus (HCV). Infection with either agent may present later as a fatal illness, in the case of HIV as the Acquired Immunodeficiency Syndrome (AIDS) and in the case of HCV infection as cirrhosis and hepatocellular carcinoma. For each condition there are disease modifying agents but there is no cure and, unlike Hepatitis B virus (HBV), there is no effective vaccine. Hepatitis B vaccine does not provide protection for 6–10% of health-care workers who remain at risk of the disease [6].

The inflatable tray has been shown to reduce fluid contamination during lower limb surgery.

2. Description of the device

The disposable collection tray (Infla-tec®, Intavent-Orthofix Ltd, Maidenhead, UK) is a rectangular tray made of flexible plastic. It has inflatable walls and a drainage port at one end, which can be connected to a standard theatre suction unit. The tray incorporates in its floor a sieve, which prevents the drainage port becoming blocked with blood clots and other solid material. The upper surface of the walls has a self-adhesive surface to allow the tray to be folded and sealed at the end of the procedure (Fig. 1(a)–(c)).

3. Technique

The tray is delivered into the sterile field. It is placed under the limb to be operated on and universal suction tubing attached to the inlet port. The walls are then inflated using a pump operated outside the sterile field (Fig. 2). Once inflated this tubing is then attached to the drainage port at one end and the theatre suction unit at the other. Irrigation can then proceed with the tray and suction used for fluid and blood sequestration from the operation site (Fig. 3).

The tray acts as an impermeable barrier to reduce spillage. Excess blood or contaminated irrigation fluid is sucked away into sealed theatre suction units. In

* Corresponding author. Tel.: +44-117-5955198; fax: +44-117-5955924.
E-mail address: john.hardy@bristol.ac.uk (J.R.W. Hardy)

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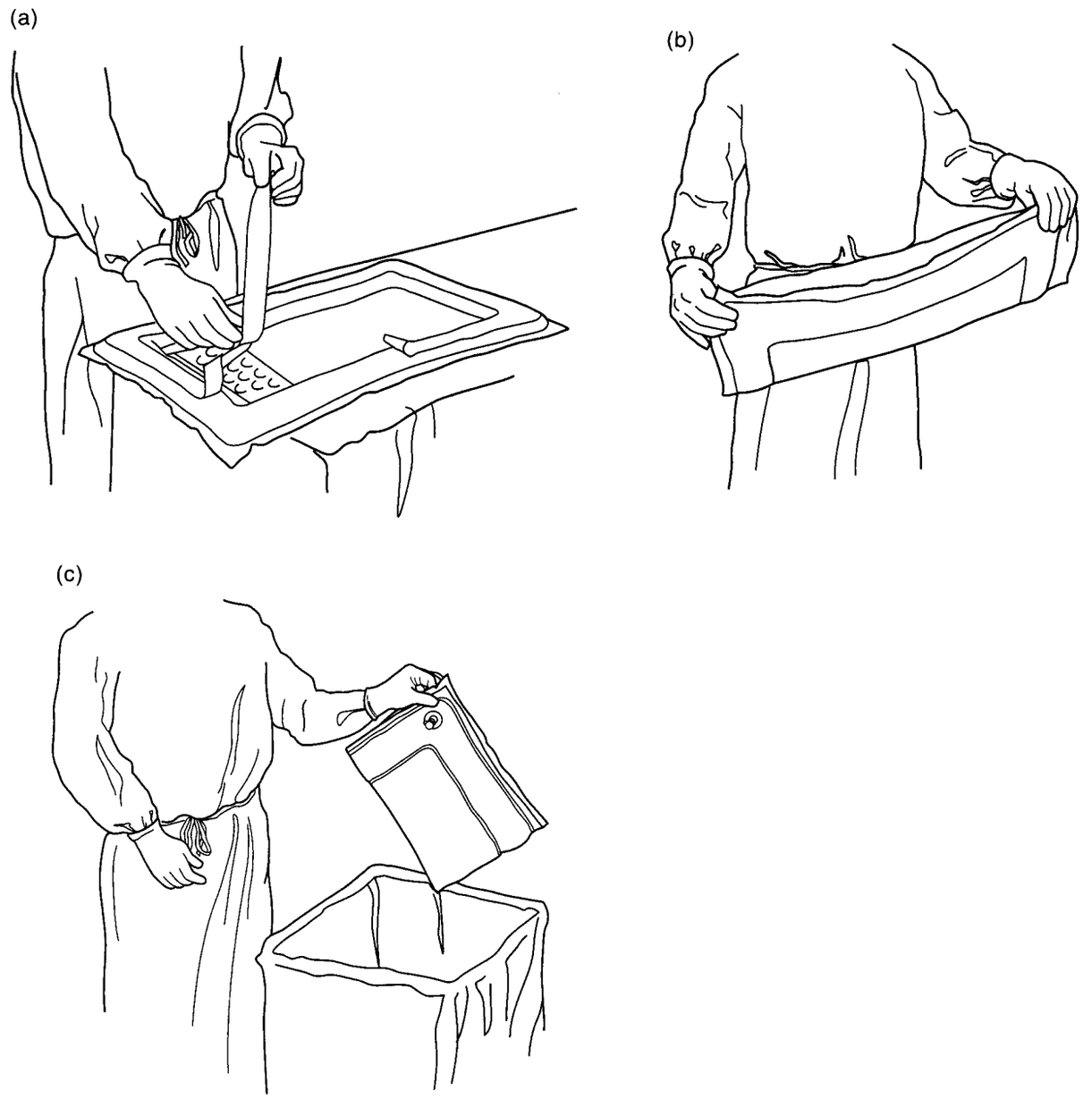

Fig. 1. (a). Removal of a release strip that protects the adhesive surround. (b) First fold of the tray to seal contents for disposal. (c). Safe disposal of the tray for incineration.

this way the tray greatly reduces contamination of the drapes, the lower part of theatre staff's gowns, feet and the floor. In addition prevention of pooling of fluid reduces contamination of the surgeon's sleeves and upper body.

4. Material and methods

A performance trial was designed to compare fluid loss between a normal kidney dish and the Infla-tec® tray. Various irrigation methods, available for lavage of a wound, were used for comparison. Irrigation using a litre jug of water, a 50 ml syringe filled from a litre jug and a giving set with a bag of saline pressurised to 100 mm Hg was performed 5 times for each method. One litre was applied for each test.

A fully draped limb was used to simulate an operation in a real theatre setting. Before each change in method the collection tray was primed with a litre of saline run through to collection because the first run always left some fluid on the walls of the collection ap-

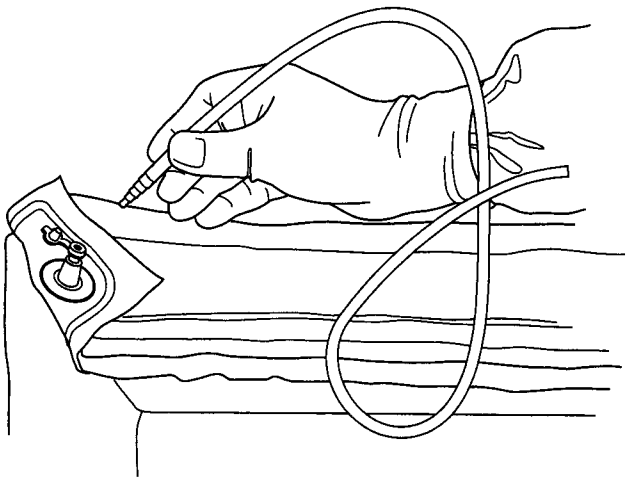

Fig. 2. Inflation of the walls using universal tubing.

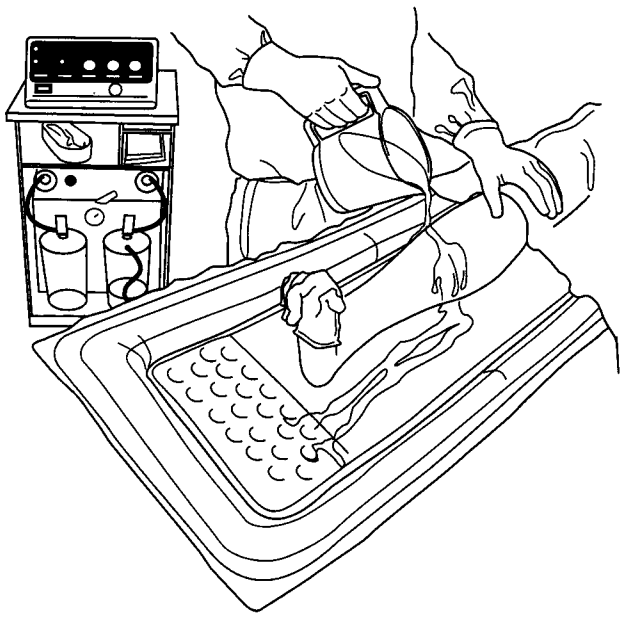

Fig. 3. The inflated tray in use.

paratus. The operator could not be blinded but was instructed to use the equipment as if he were operating for real. The saline was collected into a sealed vacuum container using the tray or a suction catheter in a kidney dish. The volume recovered after each test litre had been used was measured to the nearest 5 ml. An independent observer measured the volume of fluid recovered.

5. Results

The results of the performance trial showed that the theatre tray was 100% effective at recovering irrigation fluids when applied to the limb using a jug. When other methods of lavage were used recovery of irrigation fluid was not as complete but better than if a kidney dish was used. Use of the kidney dish depended on an extra pair of hands to hold the dish against the limb and remove the fluid and blood from the base of the dish. Measurement of volumes recovered using the different methods is tabled below (Table 1).

6. Discussion

The Infla-tec® theatre tray is a simple, quick and effective method of substantially reducing contamination during the irrigation of surgical wounds. The use of disposable non-woven gowns does not always prevent strike-through and therefore contamination [7]. However, the tray reduces the surgical and nursing staff's exposure to contaminated irrigation fluid by containment and thus reduces the cumulative exposure to potentially infective pathogens.

The containment of biologically hazardous fluids should be part of universal precautions in all operating theatres [8]. The tray is an essential device for the protection of staff involved in trauma, hand and vascular surgery.

Table 1
Comparison of use of the Kidney dish and the Infla-tec® tray

Lavage test no.	Syringe + dish	Jug + dish	Syringe + Infla-tec®	Giving set + Infla-tec®	Jug + Infla-tec®
1	840	875	950	980	1000
2	875	900	950	1000	1000
3	800	1000	970	1000	1000
4	875	875	970	975	1000
5	845	920	970	980	1000
Total volumes retrieved (ml)	4235 (84.7%)	4570 (91%)	4810 (96.2%)	4935 (98.7%)	5000 (100%)

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