CLINICAL INSIGHT

KEYWORDS: CARDIAC SURGERY I TAMPONADE I CLOTSTOP DRAINS

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1. INTRODUCTION

Bleeding following cardiac surgery is a major complication that results in chest reopening of around 5% of patients in the United Kingdom. Drainage of the chest following surgery aims to identify bleeding and therefore allow early appropriate intervention and to prevent the potentially catastrophic complication of cardiac tamponade. The routinely used drains have the problem of clots forming in the drain in the perioperative period and therefore concealing bleeding and giving rise to tamponade. Many units perform milking of the drains, which is dependent on personnel availability and experience.
ClotStop drains aim to reduce the clots blocking the drain, thus preventing accumulation of blood inside chest cavities and reducing the risk of tamponade with the possible serious complications. Therefore tube patency is critical in the early hours after heart surgery. This report describes early clinical experience with the use of ClotStop drains in cardiac surgery.

2. PATIENT INFORMATION

During the trial period from July to October 2021, a total of 19 patients received the ClotStop drain. The main demographic data is shown in Table 1. All the patients presenting for first time cardiac surgery with their disease listed in Table 2.

TABLE 1: DEMOGRAPHIC DATA OF PATIENTS

Total	19
Male / Female	12 / 7
Mean age	67.2 ± 7.2 years
Hypertension	9
Hypercholesterolemia	10
Diabetes Mellitus	3
Chronic Obstructive Pulmonary Disease	5
EuroScore II	2.12 ± 2.0

TABLE 2: CARDIAC PATHOLOGY

Primary Cardiac Condition	
Isolated Coronary Artery Disease	11
Isolated Aortic Valve Disease	3
Coronary and Aortic Valve Disease	3
Mitral Valve Disease and Atrial Fibrillation	2

3. TREATMENT

All 19 patients underwent their planned operations which are shown in Table 3.

TABLE 3: OPERATIONS COMPLETED

Procedure	Quantity
CABG X 2	5
CABG X 3	3
CABG X 4	3
AVR and CABG X 1	2
AVR and CABG X 2	1
Mitral Valve Replacement, AF Ablation and LAAO Device	2

CABG: Coronary Artery Bypass Grafts; AVR: aortic valve replacement; AF: Atrial Fibrillation; LAAO: Left Atrial Appendage Occlusion

Drainage System:	traditional underwater seal device
Catheters:	28 Fr straight and curved ClotStop® coated silicone catheters
Tubing manipulation:	None

Cardiopulmonary bypass was achieved with venous cannula in the right atrium and arterial cannula in the aorta. Mitral valve surgery was completed by bicaval venous cannulation with normal arterial cannula in the aorta. All patients had antegrade prime displacement prior to institution of routine cardiopulmonary bypass. Surgery was completed routinely utilizing cold blood antegrade cardioplegia via a cannula in the ascending aorta following artic cross clamp.

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A straight ClotStop catheter of 28 Fr was inserted in the retro-sternal space and a second ClotStop curved catheter 28 Fr in the pericardial space or the pleural space if it was opened during left internal mammary artery harvesting.

In two cases undergoing CABG both pleural spaces were opened and therefore one straight and two curved drains were utilized. The chest tubes were connected to a traditional collecting device and the suction level was set at -20 cmH_2O at the end of the surgery. The patients were transferred to the ICU in stable hemodynamic conditions and without bleeding. Chest drains remained in situ and were reviewed the following morning and removed if there was less than 20 ml of blood draining per hour for two consecutive hours and no air leak was present.

Drainage Protocol:	Set pressure: -20 cmH_2O
Drain removal criteria:	
Fluid:	< 20 ml/h during 2h
Air leakage:	No air leak

No stripping, milking, tapping or sterile suction was performed on the chest tube. **There were no reported clots blocking any of the drains and inspection of the chest tube after tube removal, showed them to be free of clots.** After drain removal, a chest x-ray was performed, which showed one pneumothorax, however it was managed conservatively.

4. OUTCOMES

All patients had their drains removed on the first postoperative day with drainage time varying between 13 to 21 hours. No patient had tamponade or developed late pericardial or pleural effusion and mean hospital stay was 7.2 ±2.1 days. There was no mortality in the group of patients and five patients developed atrial fibrillation in the postoperative period requiring medical therapy. The ClotStop drains were easy to insert once experience was gained and had prevented clots occluding the drain in any of the patients operated on. There were no complaints of pain or discomfort from the patients and no adverse comments from the nursing staff regarding the removal of the drains.

5. DISCUSSION AND CONCLUSION

The need for an improved catheter that can prevent clot blockage is high. **According to our experience, the ClotStop catheter presents a safe, efficient and reliable alternative** to conventional catheters **that maintains chest tube patency for efficient drainage in the early hours after cardiac surgery.** It was easy to handle and no clotting was observed in the catheter despite a significant drainage. Insertion of the ClotStop initially was slightly difficult to pass through the chest or abdominal wall as the drain end was getting stuck. After review and reflection, it was figured out that applying the Roberts instrument across the two sides of the end of the drain as shown in Figure 2 rather than Figure 1 made the passage of the drain much easier and avoided any tissues entering the drain.

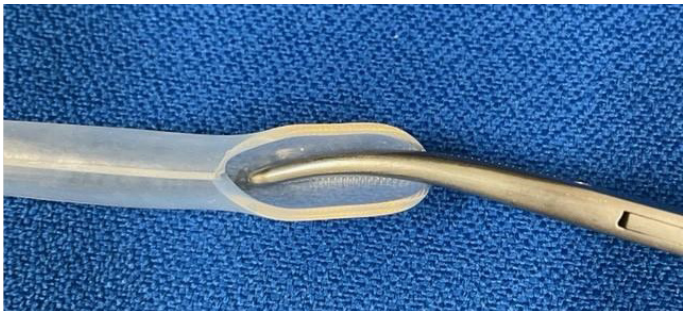

Fig. 1: Incorrect way of inserting the drain through the chest/abdominal wall

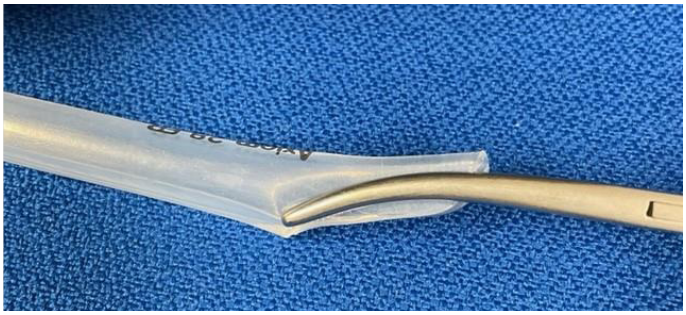

Fig. 2: Correct way of holding the end of the drain to pull through the chest/abdominal wall

Furthermore the removal of the chest tube seemed to be less painful for the patient compared to conventional catheters.
I believe these drains are an excellent addition to the tools used in cardiac surgery to minimize retained clots and tamponade.

Disclosure: The ClotStop drains were provided by Medela AG.

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