How to remove an embolized TriClip from the femoral vein? Case report.

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Author contributions:

Issameddine Ajmi: The main author prepared the first version of the case report and reviewed the existing literature related to this case. Responsible for the medical care of the patient before and after the intervention.

Steffen Schnupp: Author who contributed equally in writing this article. Source of the idea of management and removal of the TriClip at the intervention.

Hesham Mady: Participated and assisted at the intervention, reviewed and corrected the article.

Christian Mahnkopf: revised the article critically for important intellectual content and has given final approval of the version to be published.

Conflict of interest: Issameddine Ajmi, Steffen Schnupp, Hesham Mady and Christian Mahnkopf declare that they have no conflict of interest.

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Abstract:

**Background and case summary** We report a case of a 76-year old female who was admitted to our hospital because of dyspnea caused by a known high-grade tricuspid valve regurgitation. The patient received an edge-to-edge reparation of the tricuspid valve one month before the current admission using the TriClip XTR (Clip) system. The postinterventional echocardiographic results were satisfying, and the patient was discharged with tricuspid valve regurgitation grade I. At this new admission, the echocardiographic control showed a missing Clip on the tricuspid valve with a recurrent high-grade regurgitation. Fluoroscopy showed the dislocated Clip at the level of the femoral vein. This was also confirmed using Duplex sonography with no signs of thrombosis or embolization. The challenge was how to extract the Clip using endovascular methods as the patient refused any kind of surgical removal. We managed to remove the 20 x 10 mm big clip using transfemoral access and an endovascular snare system. No postinterventional complications were registered. The patient was discharged after the intervention with a new scheduled Clip procedure.

**Discussion:** This case shows a possible safe and challenging alternative to removing dislocated Clip from the femoral vein. Experienced operators are required to have the knowledge and skills to manage these possible procedural complications using the appropriate apparatus. A surgical technique would be, in this case, common practice, however as the patient declined surgical intervention, the endovascular approach was the alternative option.

**Keywords:** Case report, TriClip dislocation, endovascular removal, Snare system, Triclip complications
Learning points:

1. Different ways are available to extract a dislocated device; surgery is the most common one.
2. Interventional endovascular methods may be an alternative in well-experienced hands. Excellent knowledge of different tools and instruments with good planning of the procedure is mandatory to fulfil procedural success.
First detection of the tricuspid regurgitation

February 2020

Tricuspid valve clipping

December 2020

New admission with NYHA III/IV symptoms, detection of embolized TriClip.

February, 7th 2021

Interventional extraction of the embolized Triclip

February, 10th 2021

Detection of missing TriClip
Introduction

Complex interventional cardiovascular procedures present today a solution for a lot of patients with high risk for operation. Complications related to these interventions are a part of the daily routine of interventional cardiologists. We present a rare case of embolized TriClip XTR (Clip) system extracted using an interventional method.

Case presentation

A 76-year-old patient with a history of Clip edge-to-edge repair of the tricuspid valve regurgitation (TR) was admitted to our center with signs of heart failure (Patient's medical history is provided in table 1). The procedure took place without complication three months before the current admission with a relevant improvement of the patient’s symptoms. Echocardiography findings at the discharge showed proper Clip position, reducing the tricuspid regurgitation from grade IV to I.

The patient had lower leg edema and shortness of breath (Patient’s vital signs and physical examination findings are presented in table 2) NYHA III-IV (New York heart association classification). Echocardiography showed a recurrent tricuspid valve insufficiency Grade III-IV with a missing TriClip. We performed a fluoroscopy, which showed the dislocated clip at the femoral vein level (Figure 1). Duplex sonography excluded thrombosis and confirmed the location of the embolized clip (Figure 2) at the level of the right femoral vein. Different strategies were discussed to remove the embolized clip. Surgical removal was declined by the patient. The decision was taken after a discussion in a multidisciplinary team to try an interventional endovascular removal method. Our interventional team carefully developed the algorithm of the procedure. Oral anticoagulation with Apixaban was paused, and heparin was started as bridging before the planned intervention.

The Clip is approximately 20 x 10 mm in size. This was the reason why we believed that a large sheath is necessary to extract the embolized device from the femoral vein. A femoral
venous puncture was performed, and the choice was first taken to use a Performer™ sheath (Cook Medical, USA). The sheath is usually used in our center to perform left atrial appendage occlusion. The 16 Fr (French) sheath (length 30 cm) was assumed large enough to remove the clip. We tried repeatedly using different snare systems without success, as the clip was more oversized than the used sheath (Figure 2). The largest available sheath was a 23 Fr- sheath generally used for extracorporeal membrane oxygenation. Using a multipurpose catheter (MP), we extracted the clip with Caesar Snare System (Figure 3). The patient was discharged two days after the intervention with no complications at the intervention site.

Discussion:

Transcatheter edge-to-edge reparation for reducing mitral and tricuspid regurgitation is an established and safe method of non-operative treatment. Percutaneous mitral valve repair with different clip systems is assumed to be a secure treatment method with a low risk of potential complications (1). The Triluminate study's data approved the Clip system as a safe and effective method for treating tricuspid valve regurgitation (2). Complications such as infection, myocardial infarction, and low cardiac output syndrome were rarely reported. Despite guidelines that suggest surgical treatment (3), many patients with severe TR are still treated conservatively due to the high risk of surgery. Patients with severe TR and previous open-heart surgery are often deemed at prohibitive operative risk for reoperation. Patients in late-stage secondary TR and progressive right heart dysfunction despite medical treatment are also usually considered high risk for isolated TR repair.

In our case, no difficulty was noticed after repairing the TR (which had a secondary aetiology) with the Clip device. We were convinced of the correct placement of the device on the anterior-septal leaflets. The TOE guiding confirmed the appropriate delivery of the device with reduction of the TR from IV to I. Unfortunately, the new admission of the patient revealed the
embolized Clip. The patient declining surgical removal of the embolized clip led us to develop this method to extract the device. To our knowledge, no case of percutaneous extraction of dislocated TriClip was reported. This case shows a possible safe and challenging alternative to removing dislocated Clip in the femoral vein. The use of a large-bore sheath could cause vascular damage, which was the reason for the discontinuation of the OAC. Experienced operators are required to have the knowledge and skills to manage these possible procedural complications using the appropriate apparatus. A surgical technique would be, in this case, common practice, however as the patient declined surgical intervention, the endovascular approach was the alternative option.

Acknowledgments: No financial support was received to fund this work.

Patient consent: The authors confirm that written consent for submission and publication of this case report including images and associated text, has been obtained from the patient.

References:


Table 1. Patient information, BMI: Body mass index, GFR: glomerular filtration's rate, STS-Score: society of thoracic surgery

<table>
<thead>
<tr>
<th>Patient information</th>
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<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
</tr>
<tr>
<td>Age, years</td>
<td>76</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>23.5</td>
</tr>
<tr>
<td>Creatinine, mg/dl (NR 0.8-1.2)</td>
<td>1.5</td>
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<tr>
<td>GFR, ml/min (NR 60-90)</td>
<td>51.49</td>
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</table>

**Important baseline diseases**
- Coronary- 1-vessel disease
- Primary torrential tricuspid regurgitation (since 02.2020)
- Mild mitral valve regurgitation
- Mild aortic valve regurgitation
- Chronic renal disease
- Atrial fibrillation

**Cardiovascular risk factors**
- Arterial hypertension
- Hyperlipidemia

**Hospitalizations because of TR before TriClip Intervention**
- Four times

**Medication (before TriClip)**
- Bisoprolol 5 mg 1-0-1
- Torasemide 10 mg 2-1-0
- Xipamid 20 mg 1-0-0
- Spironolactone 25 mg 1-0-0
- Apixaban 5 mg 1-0-1
- Levothyroxine 75 1-0-0
- Pantoprazole 40 mg 1-0-0
- Atorvastatin 10 mg 0-0-1
- Ramipril 5 mg 1-0-2

**Euroscore II, %**
5.05

**STS Score (risk of mortality), %**
14

**Date of the TriClip procedure**
October 2020

**Date of TriClip extraction**
February 2021

<table>
<thead>
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<th>Cardiac dimensions</th>
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<tbody>
<tr>
<td>Left ventricle ejection fraction, %</td>
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<tr>
<td>Left ventricular end-diastolic diameter (LVEDD), mm</td>
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<tr>
<td>Left atrium, mm</td>
<td>55</td>
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<tr>
<td>Right ventricle, mm</td>
<td>45</td>
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<tr>
<td>Right atrium, mm²</td>
<td>45</td>
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<tr>
<td>Interventricular septum diameter (IVSD), mm</td>
<td>11</td>
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<tr>
<td>Tricuspid annular plane systolic excursion (TAPSE), mm</td>
<td>20</td>
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### Table 2 Vital signs and clinical examination

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<table>
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<tbody>
<tr>
<td>Temperature, C</td>
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<tr>
<td>Heart rate, bpm</td>
<td>115</td>
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<tr>
<td>SPO2</td>
<td>84%</td>
</tr>
<tr>
<td>SBP, mmHg</td>
<td>165</td>
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<tr>
<td>DBP, mmHg</td>
<td>90</td>
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<tr>
<td>Rhythm</td>
<td>Atrial fibrillation</td>
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<tr>
<td>Physical examination:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• S3 gallop</td>
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<tr>
<td></td>
<td>• Pulmonary rales</td>
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<td></td>
<td>• Peripheral lower-leg edema</td>
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<td></td>
<td>• Jugular venous distention</td>
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List of figures:

Figure 1. Fluoroscopy locating the TriClip at the level of femoral vein

Figure 2. Ultrasound at the level of the femoral vein confirming the location of the embolized clip.

Figure 3. TriClip not getting through the Performer™ Sheath

Figure 4. Successful removal of the TriClip. A- The Clip captured with the Caesar Snare System B- Successful passage of the TriClip threw the 23 Fr ECMO sheath C/D- Clip seized using the Snare System in the MP-Catheter.