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Embolize olan bir koroner stentin çıkarılması: Değişik yaklaşımların kombinasyonu

Retrieval of a embolized coronary stent: combination of various approaches

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Özet– Cihaz embolizasyonu perkütan vasküler girişimlerin potansiyel olarak ciddi bir komplikasyonudur. Bu cihazların çıkarılması amacıyla değişik cihaz ve teknikler kullanılmaktadır. Bu yazıda, 77 yaşında bir erkek hastada sol ana koroner ağzında balondan sıyrılan ve sağ femoral artere embolize olan bir koroner stentin çıkartılması sunuldu. Stent kement ile çıkarılamadı, içinden geçirilen bir balon yardımıyla koroner damardan çıkarıldı. Daha sonra sağ femoral artere kaçan stent, içinden geçirilen balon ve femorofemoral tel halkası yapılarak sağlanan destek kullanılarak hastadan biyopsi forsepsi ile çıkarıldı. Sonuç olarak, vasküler sistem içine embolize olan cihazların çıkartılması için standart bir yöntem bulunmayıp, olgunun durumuna ve operatörün yaratıcılığına göre farklı yollar ve bunların kombinasyonları kullanılabilir.

Summary– Device embolization is a potentially serious complication of percutaneous vascular interventions. Various devices and techniques can be used for the retrieval procedure. Herein, we report the retrieval of a stent in a 77-year-old male. that slipped away from the balloon in the left main coronary artery and then embolized to the right femoral artery The stent could not be retrieved by snare, but it was removed from the coronary tree via a balloon advanced inside it. The stent then escaped into the right femoral artery. Using a balloon catheter advanced through the stent and then via a biopsy forceps advanced over a femoro-femoral wire loop, we were able to remove the stent from the patient. In conclusion, there is no proven standard method for the retrieval of embolized material. Different techniques and devices can be used depending on the creativity of the operator as well as the individual situation of the case.

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Abbreviation:
Cx Circumlex artery

One of the most important complications encountered during percutaneous intravascular interventions is embolization of the device or its components. Some of these cases progress without symptoms, majority of them cause serious risk of morbidity, even mortality. Especially if intracoronary stent slips off from the balloon, then urgent decision should be made which requires use of various devices, and methods. Most of the time standard techniques, and devices can be specifically modified according to the pecularities of the case.

In this paper, we report retrieval of a coronary stent that slipped off from its balloon at the orifice of the main coronary artery, and then embolized into the right femoral artery

CASE PRESENTATION

A 77-year-old male patient underwent coronary angiography for his typical chest pain. A 7 F- sheath was implanted into the right femoral artery, and the procedure was performed using JL4, and JR4 diagnostic catheters. A 99 % stenosis was detected in the circumflex artery (Cx), and decision to intervene was made. Left main coronary artery, Cx, and left descending coronary artery were calcific. A 7 F EBU guiding catheter (Medtronick, USA) was engaged in the left main coronary artery. Following balloon dilation, a 2.75 x 18 mm sized bare coronary stent (Euca CCflex [Eucatech, Germany]) was successfully engaged on the lesion in Cx., and full patency was achieved.

However distal to the stent, a second lesion not previously apparent, but evaluated as a serious entity was detected. This lesion which did not dilate sufficiently after intracoronary nitrate administration, so it was decided to stent the lesion. However the second stent which was planned to be engaged on this lesion (2.5x18 mm Euca CCflex [Eucatech, Germany]) could not be advanced to the targeted lesion, and slipped off from its balloon at the level of the left main coronary artery orifice during its withdrawal into the catheter (Figure 1a). At that time stent was over the guidewire. Stent balloon was tried to pull back into the stent again with no avail.. Then a 5 mm-caliber snare (Amplatzer GooseNeck Snare, Covidien Co, MN, USA) was negotiated over the guidewire, but it couldn't be advanced beyond left main coronary orifice. Then the snare was taken out, and a smaller caliber (1.5 x 10 mm) balloon was passed through the occluded stent, and inflated distal to the stent. Subsequently, all system, including the guiding catheter were pulled back slowly. However while trying to enclose all system into right femoral sheath, stent sticked to tip of the catheter, and embolized to the first perforator branch of the right deep femoral arter (Figure 1b). Meanwhile, stent opened partially due to passage of the inflated distal balloon. Removal of the device from the side branch of the femoral artery using a snare was decided on, and a 8 F sheath was implanted into the left femoral artery. With the aid of a guidewire (0.038 inch), and a diagnostic catheter (5 FrJR4) arterial branch with an embolized stent was approached. However snares with diameters of 10 mm or 5 mm (Amplatzer GooseNeck Snare, Covidien Co, MN, USA) could not entrap the stent.. A 0.014 inch guidewire was passed through the stent. Then a 2.5 x 15 mm balloon was inserted through the stent, and inflated. All of the system was retracted slowly (Figure

1c). However already opened stent could not be retracted into the femoral sheath. (Figure 1d) During this maneuver, the segment of the stent between the distal balloon, and the orifice of the sheath was structurally deformed. To prevent its reembolization, our decision was to entrap 0.014 inch guidewire within the stent with a snare advanced through the right femoral artery. Right femoral sheath was dilated to 9 F, and a snare was inserted through this sheath the guidewire was grabbed from its distal part. Traction maneuver applied from the right side of the guidewire could not achieve entry of the stent access into the left sheath. Then tip of the guidewire was taken out of the femoral sheath, and femoro-femoral loop was constructed. (Figure 1e). The balloon was deflated, and taken out. Stent was advanced forward over JR4 catheter, and guidewire, towards the right sheath. Still stent could not be placed in the sheath. Then the stent was compressed between the orifice of the right femoral sheath Then the tip of the catheter advanced from the left side (Figure 1f) was grasped with the biopsy forceps delivered from inside the right sheath (Figure 1g) , and retrieved successfully (Figure 1h). Lesion distal to Cx was observed again after application of nitroglycerine boluses, and the evaluation of the functional status of the narrow segment using fractional flow reserve method in the next catheterizatiom session, and then the procedure was terminated.

During the procedure, unfractionated heparin was administered to keep the active coagulation time over 250 msec. Mean procedure, and scopy times were 95, and 64 minutes, respectively.

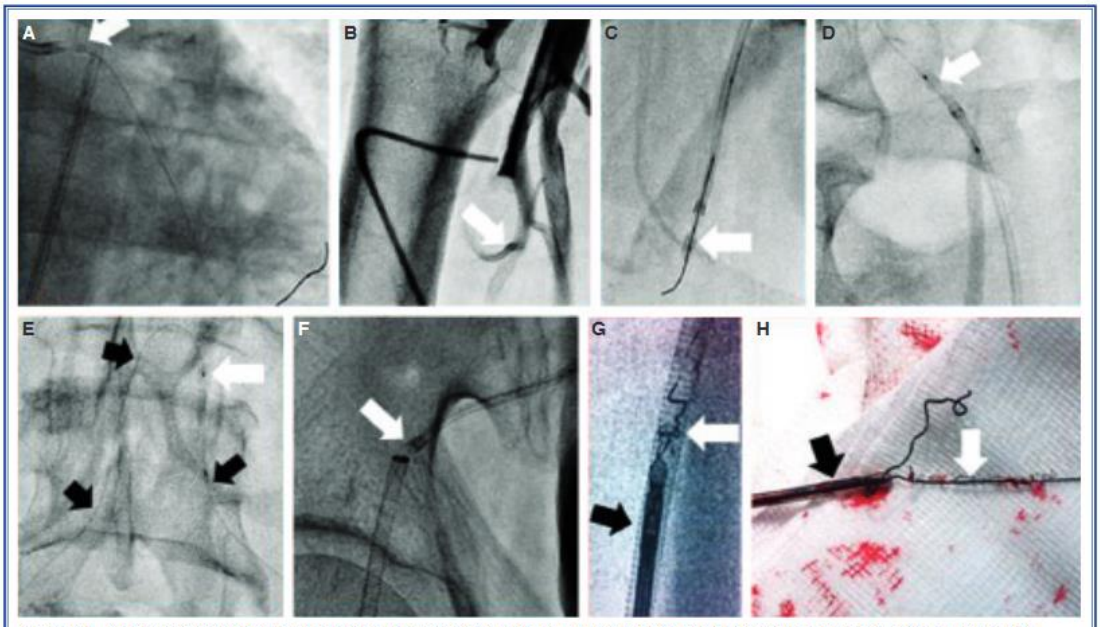

Figure 1. (A) Stent (arrow) was slipped away from the balloon at the level of the left main coronary artery orifice (B) Stent (arrow) was then embolized into the first perforator branch of the right deep femoral artery (C) Stent and the device as a whole is retrieved with the aid of a balloon (arrow) inflated distal to the stent (D) However with this maneuver stent (arrow) could not be retrieved into the left femoral sheath.(E) To prevent reembolization of the stent (white arrow), and aid in procedures to be applied, guidewire was grasped from inside the left femoral sheath, and a femoro-femoral loop (black loop) was constructed (F) Stent (arrow) was stabilized between the catheter advanced from inside the left femoral sheath, and orifice of the right femoral sheath (G) Biopsy forceps (black arrow) delivered through the right femoral sheath, could retrieve the stent (white arrow) (H) Biopsy forceps (black arrow), and deformed stent (white arrow)

DISCUSSION

With rapid increase in the number, and prevalence of percutaneous coronary interventions, their related complications have also seen more frequently. One of the most important problem with these interventions, is remote, and indirect employment, and manipulation of these articulated/complementary devices. Especially, retrieval of the entrapped intracoronary stents is a challenging procedure, and it can cause serious complications as intracoronary thrombosis, and coronary dissection.[1,2] Standard management procedure for the retrieval of entrapped stents is not available yet. Therefore each case can turn into an "adventure" requiring prompt decisions. However during these procedures important rules should be obeyed, and implemented.[3] Important causes of slipping off the intracoronary stent from the balloon are serpentine vascular structure, calcification or failure to predilate the targeted lesion .[4] In our case, proximal calcification, and rigid vascular structure most probably aborted attempts at advancement of the stent, and also caused the stent to slip away from the balloon during the retrieval process. In our case, proximally placed stent might prevent further advancement of the second stent. Therefore if implantation of more than one stent into the same vessel is planned, starting the procedure from the distal lesion is the most logical approach. In our case, since at the beginning, distal lesion was not apparent, priorly proximal lesion was stented. Afterwards distal lesion became visible, and it was seriosly evaluated. During retrieval process of the stent, proximal part of the stent is frequently stuck to the tip of the guiding catheter at the level of the coronary artery orifice To prevent development of this complication, coronary artery, and orifice of the catheter should be aligned during retrieval of the stent into the introducer

In cases where stents slipped over the balloon, as a first step stent should be placed away from vital or potentially hazardous regions. If the stent is slipped off inside the coronary artery, its removal should be attempted, and if not possible it should be deployed in an appropriate region inside the coronary artery. If the second alternative is to be employed, then stent should be optimally dilated, and fully opened inside the vessel.[4,5] Otherwise, stent might induce acute or subacute thrombosis, and acute coronary syndrome. Stents resistant to retrieval attempts can be crushed with a second stent to be inserted in the vessel. During removal of the stent utmost care should be exercise not to embolize the stent especially into the cerebrovascular system. To that end, above all safe retrieval of the stent up to the descending aorta or even infrarenal region should be targeted. During this procedure, it is critical to avoid detachment of stent from the guidewire. If it happens, guidewire should be positioned in the most distal region as possible, and thus segment of the guidewire distal to the stent should be kept relatively longer. Afterwards, the most optimal approach is to slide forward a snugly fitted microsnare over the guidewire. When the loop is passed over the proximal part of the stent, microcatheter of the snare is advanced forward to grasp, and squeeze the stent, and retrieve snare-stent-guidewire combination as one- piece. If snare is stuck in the vessel, and could not be retrieved, stent should be tried to be removed with the aid of a twisting wire or another balloon with a smaller diameter.[6] In the first alternative method a second guidewire is advanced alongside the stent, then distal ends of the first and

the second guidewires are passed through the same torquer, and a spiral was formed by a twisting manoeuvre so as to retrieve the system as whole. However in the smaller caliber balloon method, generally 1.5-2 mm balloon is advanced distally over the guidewire passing through the stent, inflated, and and pulled back into the catheter. If balloon could be advanced only partially, most of the time it is sufficient to inflate the balloon with low pressure before its retrieval. Meanwhile, ıf the stent do not gain access into the catheter, do not exert force on the stent, and balloon-stent-catheter-guidewire combination should be retrieved as a whole into the descending aorta. Do not forget that the retrieval of the inflated balloon into the coronary artery can endanger life, and requirements for emergency intervention should be at hand.

In our case the abovementioned steps arwere realized properly. Priorly, the snare with the smallest loop size (5mm) was used to remove the stent, but the snare could not be advanced through the coronary artery. Then, balloon was delivered to the distal part of the stent, and inflated. With the aid of the inflated balloon, all system was positioned on the relatively safe infrarenal region. During retrieval of the stent into the sheath at this region, it slipped away from the balloon, and embolized into a perforating branch of the deep femoral artery. In this application take care to position the inflated balloon distal to the stent. When the stent is stuck on the orifice of a sheath or a catheter, retrieved balloon passes through the stent, and places the stent in an insecure position, also dilates, and alters its shape. This condition was also encountered in our case. Retrieval of the balloon inflated distal to the stent, impaired the texture of the stent, and stent slipped away from the system was embolized to the distal regions. If the stent can not be drawn into the sheath with the aid of the distal balloon, advance the guidewire as far as possible, deflate and retract the balloon distal to the stent and deliver a snare over the guidewire as described above.

At the next step, we decided to remove the stent embolized to a branch of the femoral artery. To that end, a 9 F sheath was implanted into the left femoral artery, and the intervention was proceeded from the left side. During extraction of embolized foreign substances, it is recommended that caliber of the sheath should be at least 2 F larger than that used at the beginning of the procedure. In our case, we firstly tried to grasp, and remove the stent with a snare, however because of narrower vascular lumen snare engaged on the proximal end of the stent, and could not be advanced. Then retrieval manoeuvre was attempted with the aid of the balloon advanced distally. Stent was pulled out from the perforator branch, and positioned successfully on the orifice of the left femoral sheath. However despite the presence of 9F sheath inside the left femoral artery, partially enlarged, and deformed stent could not be retracted again into the sheath. Later stages of the procedure were applied in accordance with the specific decisions. One of the critical applications is to grasp the distal part of the guidewire with a snare to form a safe femoro-femoral loop. On the other hand, dilatation of the right femoral sheath to 9 F is also an important process applied before the abovementioned manoeuvre. Indeed in the last step stent could be drawn into the sheath using a biopsy forceps.

Another debatable issue concerns the opinion that leaving a stent embolized to a peripheral artery in situ might not most of the time create any problem.[7] However in this case we decided to withdraw the stent. Even if successful

retrieval is achieved eventually, procedure performed after the decision-making process have been associated with realization of more complex manoeuvres, increased patient, and operative team stress, prolonged scopy times, operating with various devices, and resultant higher costs.

In conclusion, slippage of the intracoronary stent away from the balloon is a complication which might be always experienced by interventional cardiologists As a priority, predilation of serious target lesions, maintainence of a direct linearity between guiding catheter, and coronary artery, and use of appropriate guidewires will decrease the likelihood of stent slippage. If it happens, as a general rule perform manoeuvres with minimal harm to the patient, and prevent embolization of the stent especially to the cerebrovascular system. Interventional cardiologists should be prepared for various scenarios for the retrieval of slipped stents or other foreign substances, and use of different types of devices. Catheterization laboratories should have adequate equipment at hand in case of need.

Conflict of interest: None declared.

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Key words: Angioplasty, balloon, coronary; device failure; device retrieval/in strumentation; coronary artery disease/surgery; stent.