

# Occlusion of the Abdominal Aorta by Balloon Dilation Catheter Assisting Surgical Excision of a Sacrum Chordoma: Case Report

## Abdominal Aorta Balon Oklüzyonu Sakral Cerrahide Kanamayı Azaltır: Olgu Sunumu

### ABSTRACT

Chordoma is known to be the most common primary tumor of the sacrum. Its surgery is challenging from many aspects. A large amount of bleeding is one of the biggest issues. A 52-year-old woman was admitted to our clinic with a huge mass at sacrum. The mass was diagnosed as chordoma after a needle biopsy. Prior to the surgery, a balloon dilation catheter (BDC) was placed in the distal abdominal aorta via the femoral artery. Just after the skin incision, the BDC was inflated with contrast medium and total occlusion of the aorta was achieved. At the end of the operation we observed that total hemorrhage had decreased dramatically. No complications were recorded except hypertension during the occlusion of the aorta which was expected. The patient was discharged after two weeks of hospitalization post-operatively without any neurological deficit. Our report is the second in the neurosurgical literature to our knowledge. Although this result is preliminary and needs to be replicated and expanded upon, our first experience with this method is effective for decreasing the amount of bleeding. We believe that our method prevents hemo-dynamical problems caused by massive bleeding and complications secondary to massive transfusion.

**KEY WORDS:** Balloon dilation catheter, Sacrum, Chordoma

### ÖZ

Kordoma sakrumun en sık görülen primer tümörüdür. Cerrahisi birçok yönden güçlükler arz eder. Tümör çıkartılması sırasında meydana gelen aşırı kanama bunlardan birisidir. Kuyruk sokumunda devasa kitle yakınmasıyla başvuran 52 yaşındaki kadın hastanın iğne biopsi sonucu patolojik tanısı kordoma olarak belirlendi. Cerrahi girişim öncesinde balon dilatasyon kateteri (BDC) femoral arter yoluyla distal abdominal aortaya yerleştirildi. İnsizyon sonrasında BDC kontrast maddeyle şişirilerek aortanın total oklüzyonu sağlandı. Girişimin sonunda toplam kanama miktarının dramatik şekilde azaldığı görüldü. Aorta oklüzyonu sırasında meydana gelen, ve önceden hazırlıklı olunan hipertansiyon atağı dışında herhangi bir komplikasyonla karşılaşılmadı. Hastada ek bir nörolojik defisit gelişmedi ve iki hafta sonra taburcu edildi. Sunulan olgu ve metod nöroşirürji literatüründe ancak ikinci kez yer almaktadır. Metodun daha fazla olguda denenmesi gerektiği ortadır ve aldığımız ilk sonuç bu yönde teşvik edicidir. Metodumuzun sakrum kordoması olgularında cerrahi rezeksiyon sırasında meydana gelen yoğun ve abondan kanamanın önlenmesinde etkili olduğunu düşünmekteyiz.

**ANAHTAR SOZCÜKLER:** Balon dilatasyon kateteri, Sakrum, Kordoma

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## INTRODUCTION

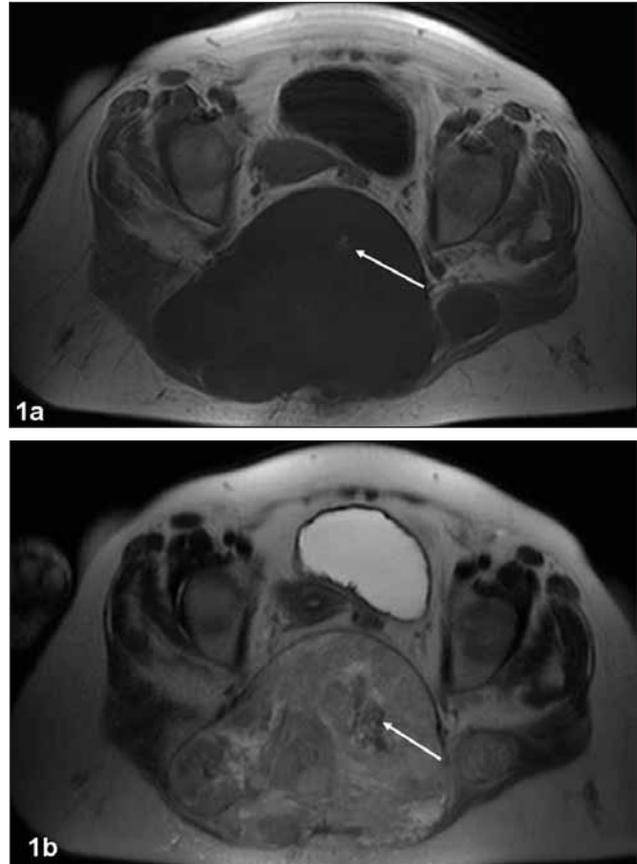
Although chordoma is a rare pathology and accounts for 3-4% of all primary malignant tumors of bone, it represents the most frequent primary tumor of the sacrum (2,12). In theory, a long tumor-free survival and even total cure seems to be possible via en-bloc resection (3,20). However, despite the progress in surgical and anesthesia technology, it is still not always possible to perform a total resection. The difficult anatomical neighborhood and patient-related factors as regards such a complex surgery can be limiting for the surgeons (17). Chordoma originating from the sacrum usually have a tendency to be silent till reaching extreme volumes. Such a giant mass at that sensitive location dictates hours of surgery, usually combining anterior and posterior approaches which bring high risk to older patients with other systemic diseases.

In our case, the patient herself refused en-bloc resection because of the risk of sacrificing sacral roots which could cause sphincter disturbances that she did not have before the surgery. We know from experience that abundant hemorrhage is one of the most challenging per-operative problems with intratumoral resections. Ligation of the internal iliac arteries and clamping of the aorta have been described in some cases to decrease the bleeding but these are not possible during a posterior only approach. While searching for new methods to cope with this problem, collaboration of our interventional radiology department supported us to perform the technique we report herein.

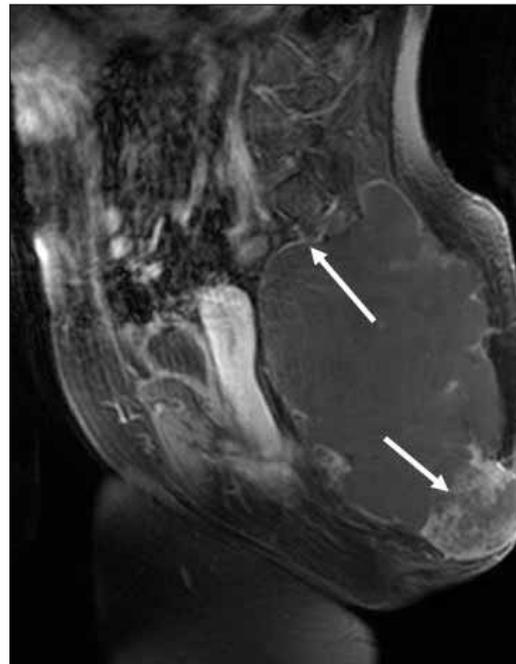
## CASE REPORT

A 52-year-old woman was referred to our department with local pain on the sacrum and a giant sacral mass impairing her sitting and lying on back. Her CT and MRI examinations depicted a tumor originating below S2 (Figure 1A,1B, 2). A true-cut biopsy prior to the surgery revealed a diagnosis of chordoma. On admission she was able to walk alone but needed assistance while sitting down. No sphincter disturbance was detected on neurological examination, but she was suffering from urination and defecation problems due to the mass effect of the tumor.

On the day of surgery, the patient was transferred to the interventional radiology unit early in the morning. The biggest problem was to keep the patient in the supine position during the insertion of



**Figure 1:** Axial T1W (A) and T2W (B) pelvic MRI images revealing macro-lobulated giant mass with hemorrhagic foci. Hemorrhage causes hyper intense foci in T1W and hypo intense foci in T2W images marked by arrows.



**Figure 2:** Post-contrast sagittal T1W MRI image revealing peripheral enhancement.

the BDC via the femoral artery as her sacral mass caused pain and discomfort. She was put on sedation for her pain but not intubated for general anesthesia. One of the key points was to protect the bilateral renal arteries when the BDC is filled and the distal aorta occluded. Their patency was checked by contrast application at the end of the procedure which took a total of 20 minutes. The balloon was emptied again and the distal end of the catheter was fixed very carefully to the inguinal region to prevent any displacement. The patient was taken to our operation theatre as soon as the intervention was completed in the radiology department. She was carefully put in the prone position this time on the operation table. Our C-arm was ready and a senior radiologist was present just before the BDC was inflated with contrast medium after the skin incision. Filled with contrast medium, the balloon was once more found to be distal to the renal arteries as expected (Figure 3A, 3B). The arterial pressure not surprisingly increased to 180 mm Hg during the first minutes but intervention of the anesthesia team was enough to pull it down to about 130 mm Hg again. We observed that the effect of the occlusion of the aorta diminished the bleeding beyond our expectation during debulking of the tumor. The whole site as well as the sacral roots were all visible during the debulking for the very first time compared to our prior experiences with such cases. One suction tube was enough whilst two of them had usually not been without occlusion. The whole surgery took 40 minutes and total bleeding was 800 cc. There were no neurological deficits in the early post-op examination.

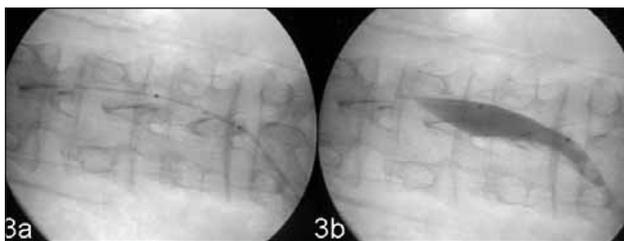
### DISCUSSION

Massive hemorrhage is a challenging issue for any surgeon from any discipline as it is a life-threatening situation for the patient, especially when it is unexpected. Chordoma is known to be a

hemorrhagic pathology and abundant bleeding during its surgery has never been surprising. Even when it is controlled and hemodynamic stability is established per-operatively, risks of viral contamination and complications of ion imbalances or less often problems like pulmonary injury may arise post-operatively due to multiple transfusions (7,9,14,20)

Experimental and clinic reports suggesting occlusion of the distal aorta via balloon catheter have been published starting from the mid 80's (16,18,19). In recent years there have been more cases reported about experiences and improvements of this technique especially from cardio-surgery besides gynecology and general surgery (1,4,5,6,8,10,13,15). Finally, a single report has been published from China about the usage of BDC occlusion of the aorta with a pathology concerning neurological surgeons (11).

As a reference center for spine pathologies in the western part of Turkey, six to eight de-novo cases of sacral tumors present at our institute every year. The most common primary pathology in this location is chordoma (2,12). Although any pathology in this region is challenging due to the anatomical difficulties, excessive bleeding is an additional issue with a diagnosis of chordoma. The current literature on the sacral chordoma has usually focused on the stabilization and instrumentation problems after total sacrectomy. However, our experience shows that excessive hemorrhage is one of the most challenging issues during these surgeries. To our knowledge this is the second report in the literature regarding the application of a BDC to the distal abdominal aorta to decrease bleeding during sacral chordoma resection (11). Parallel to the first report we have observed that it is dramatically effective for this purpose. Decreasing the risk of unexpected neural injuries by clearing the site and decreasing surgery time are the secondary benefits. We would like to emphasize that the BDC technique can provide not only hemodynamic stability but also a good view of the operative field. Detailed cardiological pre-operative evaluation is a must because of a major increase in after-load during occlusion of the aorta. Tight collaboration with interventional radiology and anesthesiology is the other key-point to prevent any morbidity such as occlusion of the renal arteries. There is no doubt that more experience is needed for the improvement of our method.



**Figure 3:** C-arm images taken at the operation theatre, prior to (A) and after (B) the inflation of the balloon dilation catheter in the abdominal aorta with contrast medium.

## CONCLUSION

Our report is the second in the literature to our knowledge. Although this result is preliminary and needs to be replicated and expanded upon, our first experience with this method is effective for decreasing the amount of bleeding. Sacrum chordoma is a challenging pathology for neurological surgeons from many aspects. We believe that our method prevents hemo-dynamic problems caused by massive bleeding and will be helpful while trying to decrease morbidity and mortality rates, in both the per-operative and post-operative periods.

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