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*Case Report / Olgu Sunumu*

# A successful balloon angioplasty procedure in a 1050 gram premature infant with coarctation of the aorta

*Aort koarktasyonlu 1050 gram prematüre bebekte başarılı balon anjiyoplasti işlemi*

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Surgery is the primary treatment of aortic coarctation in all newborns, including low birth weight premature infants. Balloon angioplasty procedure in the treatment of native coarctation of the newborn is controversial due to high rates of restenosis and complications such as increased risk of aneurysm formation and damage to the peripheral artery involved in the intervention. Balloon angioplasty is often performed as a palliative treatment particularly in newborns with impaired cardiac functions indicating high rates of mortality. We believe that this procedure may be performed as a palliative treatment for low birth weight infants in centers lacking adequate surgical experience. Herein, we define a successful balloon angioplasty procedure which we carried out using the femoral artery route in a low birth weight premature infant with coarctation of the aorta.

*Keywords:* Balloon angioplasty; coarctation of the aorta; low birth weight; premature.

Düşük doğum ağırlıklı prematüre bebekler de dahil, tüm yeni doğan bebeklerin aort koarktasyonunda birincil tedavi cerrahidir. Balon anjiyoplasti işlemi, tekrar daralma oranlarının yüksekliği, anevrizma oluşumunda artmış risk ve girişimin neden olduğu periferik arter hasarı gibi komplikasyonlar nedeniyle yenidoğan nativ koarktasyonunun tedavisinde tartışmalıdır. Balon anjiyoplasti, genellikle cerrahi mortalite oranlarının yüksek olduğu kalp fonksiyonları iyi olmayan yenidoğanlarda palyatif olarak yapılmaktadır. Cerrahi deneyimi yeterli olmayan merkezlerde, düşük doğum ağırlıklı bebekler için bu işlemin palyasyon amaçlı yapılabileceğini düşünüyoruz. Bu yazıda, düşük doğum ağırlıklı prematüre aort koarktasyonlu bebekte femoral arter yolu kullanılarak gerçekleştirdiğimiz başarılı balon anjiyoplasti işlemi tanımlandı.

*Anahtar sözcükler:* Balon anjiyoplasti; aort koarktasyonu; düşük doğum ağırlığı; prematüre.

Surgical repair is the primary treatment for native coarctation of the aorta in newborns and infants.[1] Although experience in the use of balloon angiography for the treatment of this condition has gradually increased since it was first introduced in 1982, high rates of restenosis and complications such as an increased risk of aneurysm formation and damage to the peripheral artery involved in the procedure have been the main reasons that have prevented this procedure from becoming the treatment of choice.[2] However, balloon angioplasty has been performed as a palliative treatment in certain centers due to the high rates of mortality and morbidity associated with surgery in newborns presenting with the clinical manifestations of cardiogenic shock.[3] We also believe that this procedure may be performed as a palliative

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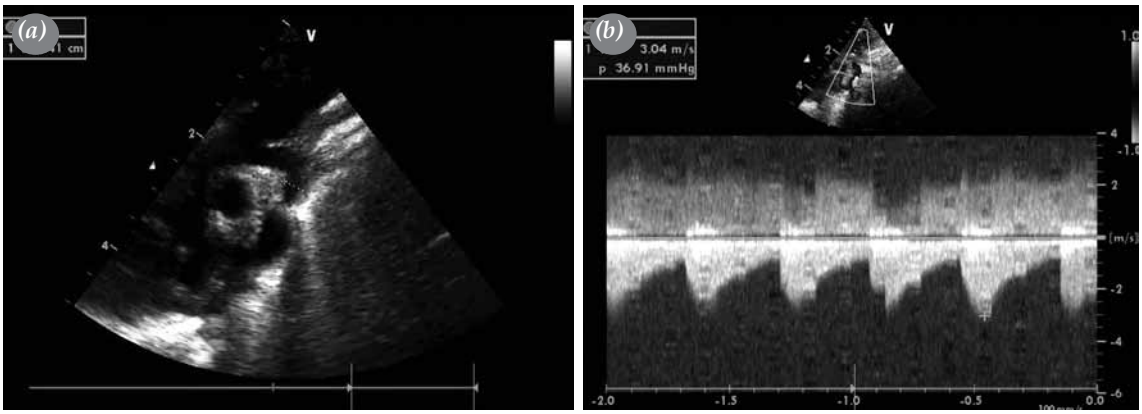


**Figure 1.** Echocardiography prior to intervention showing **(a)** the discrete aortic coarctation and **(b)** pressure gradient of 36 mmHg extending into diastole on continuous-wave Doppler.

treatment for low-birthweight infants in centers lacking adequate surgical experience. Herein, we report our experience involving successful balloon angioplasty via the femoral artery route in a low-birthweight premature infant.

## CASE REPORT

A five-day-old, premature twin born at the 32nd gestational week was referred to our clinic from another medical center due to the detection of a cardiac murmur while being followed up for a diagnosis of premature and intrauterine growth retardation. The patient was underwent a resuscitation procedure after birth and was observed under mechanical ventilation support for one day. A physical examination revealed a body weight of 1,050 g, a peripheral pulse of 140/minute, a respiratory rate of 64/minute, blood pressure levels of 85/44 mmHg (upper extremity) and 58/33 mmHg (lower extremity), and a body temperature of 36 °C. The medical state of the infant was good, and he was not cyanotic. However, both femoral artery pulses were poorly palpable, and heart auscultation revealed a grade 2/6 systolic murmur. In addition, echocardiography detected a dilated, hypertrophic right ventricle, a discrete aortic coarctation [36 mmHg gradient extending into diastole on continuous-wave (CW) Doppler], and ductal patency (Figure 1).

Catheterization was performed under general anesthesia, and 50 IU/kg of heparin was administered intravenously during the procedure. A 22-gauge needle was then inserted into the left femoral artery, and a 0.014 percutaneous transluminal coronary angioplasty (PTCA) guidewire (Balton Sp. z o.o., Warsaw, Poland) was advanced through the artery. An interesting feature of this guidewire was that the distal soft, flexible tip had a radiopaque marker of approximately 25 mm in length. Next, a 3-French (3F) dilator was advanced over the guidewire, but the sheath was not inserted in order to prevent damage to the femoral artery. Angiography was performed by giving the contrast medium through the dilator, which revealed ductal patency and a discrete coarctation of the aorta with a pressure gradient of 36 mmHg (Figure 2). Subsequently, the dilator was removed, and an angioplasty procedure to treat the coarctation of the aorta was carried out using a 3x15 mm balloon catheter (Shanghai MicroPort Medical (Group) Co., Ltd., Shanghai, China) that was advanced through the femoral artery over the guidewire. The coarcted aortic segment was observed to be enlarged after the procedure, and the pressure gradient was reduced to 7 mmHg. However, in the angiography performed after the procedure, a very small amount of the contrast medium was observed to pass into the subendothelial field. No difficulty was experienced in the removal of the dilator, and the lower extremity blood flow was normal during the observation period. Furthermore, no other complications were observed following the procedure, and no medications were given to the patient during the observation period. Moreover, the arterial blood pressure measurements were within normal limits. Stenosis was also not found at the coarctation site by echocardiography, and the patent ductus arteriosus closed spontaneously.

Unfortunately, recoarctation developed one and a half months after the balloon angioplasty procedure. When the child reached 1,800 g, another surgical procedure including the coarcted segment was resected from aorta and end-to-end anastomosis of distal to proximal segments of aorta were successfully performed and patient was discharged one month after the operation.

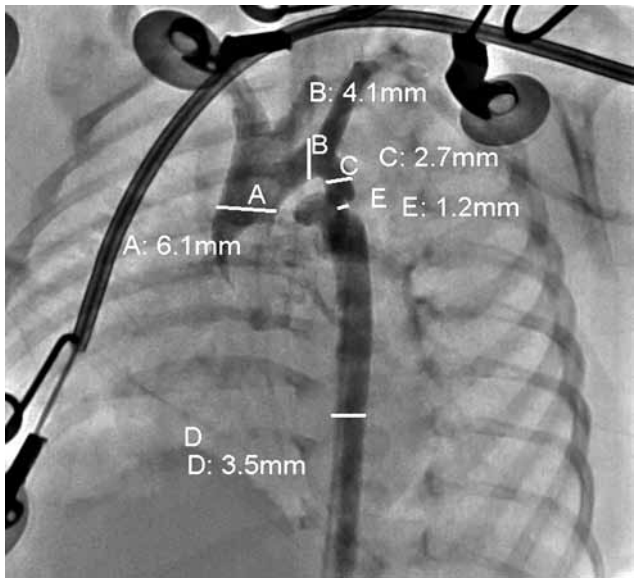


**Figure 2.** Aortography showing the coarctation of the aorta.

## DISCUSSION

From the newborn period to adolescence, coarctation of the aorta, which accounts for 5-8% of all congenital heart diseases, may present with several clinical manifestations according to the severity of the stenosis in the coarcted aortic segment and the development of collateral circulation. Congestive heart failure is the most common manifestation in newborns. Children and adolescents are usually asymptomatic, with the diagnosis of coarctation of the aorta usually being made as a result of investigations performed when a murmur is heard on cardiac auscultation. In addition, occasional cases of secondary hypertension and intracranial bleeding related to hypertension have also been reported.[1-3]

Although performing balloon angioplasty for the recurrence of coarctation following surgical repair is a generally accepted procedure, using it for native coarctation in newborns is controversial due to the potential complications and high rate of restenosis.[1-3] Factors such as developments in newborn care and the availability of echocardiography may lead to the early recognition of severe coarctation before the appearance of clinical symptoms. In case of mild coarctation in low-birthweight premature infants, it is recommended that they be observed under medical treatment and that surgical repair be postponed until adequate weight gain occurs. However, in infants presenting with heart failure and cardiogenic shock, the initiation of prostaglandin E1 infusion along with the addition of inotropic agents into the treatment regimen and mechanical ventilation support are crucial. The preoperative cardiac functional status is the leading factor that affects surgical mortality rates; therefore, in certain medical centers, angioplasty is preferred over surgery in such cases. We performed the balloon angioplasty procedure on our patient for palliative purposes because of our limited surgical experience with low-birthweight infants.

The incidence of recoarctation in newborns and infants under three months old ranges between 41 and 69%, whereas the rates for older infants are between 75 and 91%. In addition, the incidence of aneurysm formation in infants and children was reported as between 0% and 5%.[1-6]

There is limited available data regarding the results of balloon angioplasty in low-birthweight premature infants. In their study, Rothman et al.[4] successfully performed this procedure on six newborns with coarctation of the aorta, each of whom weighed under 2,500 g. However, recoarctation developed in three of their cases within one and a half to three months.

The procedure was carried out using only a 3F dilator inserted into the femoral artery without a

**Table 1. Summary of the demographic information, catheterization methods, and follow-up data for low-birthweight premature infants in the medical literature**

| Patients | Reference | Gestational age | Age (days) | Gender | Weight (g) | Access/sheat |
|---|---|---|---|---|---|---|
| 1 | Schamberger and Lababidi[3] | 28 | 18 | Male | 460 | Umblical artery/sheat was not used |
| 2 | Dryzek et al.[1] | 28 | 18 | Male | 580 | Right common carotid artery/ surgical cutdown |
| 3 | Rothman et al.[4] | 26 | 9 | Female | 790 | Umblical artery/3F |
| 4 | Sreeram et al.[5] | 29 | 21 | Female | 940 | Right axillary artery/3F |
| 5 | Prada et al.[6] | 32 | 17 | Male | 1200 | Left carotid artery |
| 6 | Rothman et al.[4] | – | 12 | Male | 1500 | Umblical artery/4F |
| 7 | *Our case* | 32 | 6 | Male | 1050 | Femoral artery/ sheat was not used/3F dilator |

sheath, and there was no leg hypoperfusion resulting from damage to the femoral artery during or after the procedure. In the medical literature, umbilical artery catheterization and the surgical cutdown of large arteries, such as the common carotid artery, have been reported as the entry route for balloon angioplasty in low-birthweight premature infants (Table 1).[1,3-6] In a review of the literature, our case featured the infant with the lowest birthweight to undergo a balloon angioplasty procedure via the femoral artery route without performing a cutdown.

In conclusion, the balloon angioplasty procedure may be successfully carried out without using a femoral artery sheath in low-birthweight infants with coarctation of the aorta who are small for their gestational age. However, it should be known that the procedure has risk of peripheral artery damage due to sheat not used.

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