OLGU SUNUMU / CASE REPORT

Yenidoğanda umbilikal ven yoluyla aort balon valvüloplastisi: Ülkemizdeki ilk tecrübe

Balloon valvuloplasty for aortic stenosis using umbilical vein access in a newborn: First experience in Turkey

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Özet– Ciddi doğumsal aort kapak darlığı tedavisinde balon valvüloplasti, işlem sonrası aort yetersizliği gelişmesi riski ve orta dönemde tekrar daralma gelişebilmesine karşın etkin bir tedavi şeklidir. Yenidoğanda kritik veya ciddi aort darlığının balonla genişletilmesi için en uygun damar yaklaşımı konusunda ise fkir birliği yoktur. Yenidoğanın kritik aort darlığı acilen ve etkin bir şekilde tedavi edilmelidir. Cerrahi tedavi dikkate değer morbidite ve mortalite ile ilişkilendirilmiştir. Kateter yoluyla tedavi cerrahi tedavi ile kıyaslandığında bu grup hastalarda önemli avantajlara sahiptir. Perkütan balonla genişletme darlığın acil olarak giderilmesi için sıklıkla kullanılır ve bu tedavi için çeşitli damar yaklaşımları mevcuttur. Kritik aort darlığı ve aort koarktasyonun kateter yoluyla tedavisinde umblikal arter ve ven yaklaşımı çok az sayıda hastada denenmiştir. Umblikal arter ve ven yaklaşımı yenidoğanın kritik aort darlığının balonla genişletilmesinde seçenek olarak düşünülmelidir. Mevcut kateterler ile 2.5 kg'ın altındaki bebeklerde dahi işlem güvenli, basit ve etkindir.

Summary– Despite risk of development of postprocedural aortic insufficiency, and restenosis at midterm, balloon valvuloplasty is an effective therapy for severe congenital aortic valve stenosis No consensus currently exists regarding optimal vascular approach for balloon dilatation in newborns with critical or severe aortic valve stenosis. Critical aortic valve stenosis in newborns must be treated promptly and effectively. Surgical therapy has been associated with significant rates of morbidity and mortality. Transcatheter therapy has significant advantages in this group of patients when compared with, surgical treatment. Percutaneous balloon dilatation is frequently performed as emergent therapy of valve ste-nosis, with various options for vascular approach. While umbilical artery and vein access has been tried in very few number of patients in the treat-ment of critical aortic valve stenosis and aortic coarctation. Umbilical artery, and vein access should be thought as an alternative to balloon dilatation of critical aortic stenosis. With available catheters this is a safe, simple,and effective procedure even in newborns weighing under 2.5 kg.

In the management of severe congenital aortic valve stenosis, balloon valvuloplasty is an effective treatment modality against the risk of development of postprocedural aortic insufficiency, and restenosis in the midterm.[1–3] A consensus does not exist about the optimal vascular approach about balloon dilatation of critical or severe aortic stenosis. Access into femoral artery is especially more difficult in newborns because of decreased pulse rates. Risk of femoral artery injury during percutaneous valvuloplasty during neonatal period through arterial access worries many cardiologists..[3,4] Because of considerable rates of morbidity, and mortality of surgical treatment of critical, and severe aortic stenosis in the neonatal period, transcatheter therapy carries importance in the management of this disease. [5,6] Umbilical artery, and vein access have been tried in very scarce number of cases.

In this article, we presented our experience in balloon valvuloplasty performed via umbilical vein which we thought to be the first procedure of its kind achieved in our country.

CASE REPORT

A baby weighing 2780 gr was born spontaneously via normal vaginal delivery at 37. gestational week. Fetal intrauterine echocardiography performed at 23 gestational week established the diagnosis of aortic stenosis, and it was followed up to the delivery as for the development of heart failure, and hydrops.

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Following birth PGE1 was initiated, and balloon catheter was inserted through umiblical vein, and advanced up to the right atrium. Echocardiography performed at postpartum 8. hour revealed aortic valve stenosis (the highest pressure gradient: 60–65 mm/Hg), and bicuspid aortic valve. Besides left ventricular systolic functions were evaluated as within normal limits. PGE1 was discontinued, and the newborn was brought into intensive care unit for further monitorization. Control echocardiography was performed at 32. hour, and the highest pressure gradient observed was 85 mm Hg which necessitated application of balloon valvuloplasty. A 0.018 inch guidewire was advanced through umbilical catheter, and 4F pediatric short sheath was introduced. Short sheath stucked below the level of ductus venosus, and 4F right Judkins catheter could not be advanced further. Then a 0.018 inch floppy- tipped wire was inserted within a 4 F catheter, and advanced beyond ductus venosus. Short sheath was advanced over the guidewire, up to the vicinity of the right atrium. A 0.025 inch "Terumo" hydophilic wire was advanced inside through the catheter which was advanced into the left atrium, and finally implanted in the left ventricle. Then the guidewire was negotiated through the aortic valve, and pushed forward into aorta. Over this guidewire, a hydrophilic tipped 4FJR1 catheter was advanced up to the ascending aorta. A 80 mm/Hg pressure gradient was detected, and a 0.025 inch guidewire was implanted. Over this guidewire a 7 mm x 2 cm balloon catheter was pushed forward up the level of the aortic valve, and valvuloplasty was performed to permit forward blood flow (Figure 1).

After the procedure pressure gradient decreased down to 20 mm Hg, and 2+ aortic insufficiency was observed. Aortic pressure was measured as 80/50 mmHg. On control echocardiography, the highest pressure gradient was 25 mmHg, and 1+ aortic insufficiency was detected.

At first month control echocardiography, the highest pressure gradient between LV, and aorta was 30 mmHg. A mild degree of aortic regurgitation was detected. Diameters of left ventricles were within normal limits. A mild degree of aortic root dilatation was detected.

DISCUSSION

Critical aortic valve stenosis should be purgently, and effectively treated. Surgical treatment has been associated with notable rates of morbidity, and mortality.[5,6] In this group of patients transcatheter treatment possesses important advantages when compared with the surgical treatment. Percutaneous balloon dilatation is used as emergency treatment for aortic stenosis, and for this treatment various intravenous routes are available.

In the transcatheter treatment of critical aortic stenosis, access through umbilical artery, and vein has been tried in a very few number of patients. Beekman et al. in the year 1991, firstly applied balloon dilatation using umbilical artery access in four newborns aged 2-11 days, and all of these procedures were achieved successfully.[7] One of these cases developed postprocedural sepsis. In a study by Beekman et al. the smallest newborn in their series was reportedly weighed 3.3 kg. Podnar et al performed balloon dilatation using umbilical access in infants weighing less than 2.5 kg.[8]

Femoral artery is another route of intervention used for balloon dilatation in newborns. Using this method which is also performed with 3F short sheath,and Thyshak mini balloon, complication rates have decrease relative to previous years. In a study performed by Kim et al. on 20 newborns, and all patients aged less than six months, 3F system was used, and any complication was not seen.

Five of their patients had undergone cardiac catheterization in the long term.[9]

Transvenous forward access is the most difficult technique in the treatment of aortic stenosis. It decreases the risk of femoral injury. Besides it prevents unwanted perforation of aortic valve leaflet, and also increases stability of balloon during dilatation which lowers the rate of postprocedural development of aortic insufficiency. It basically resembles access through umbilical vein.[10]

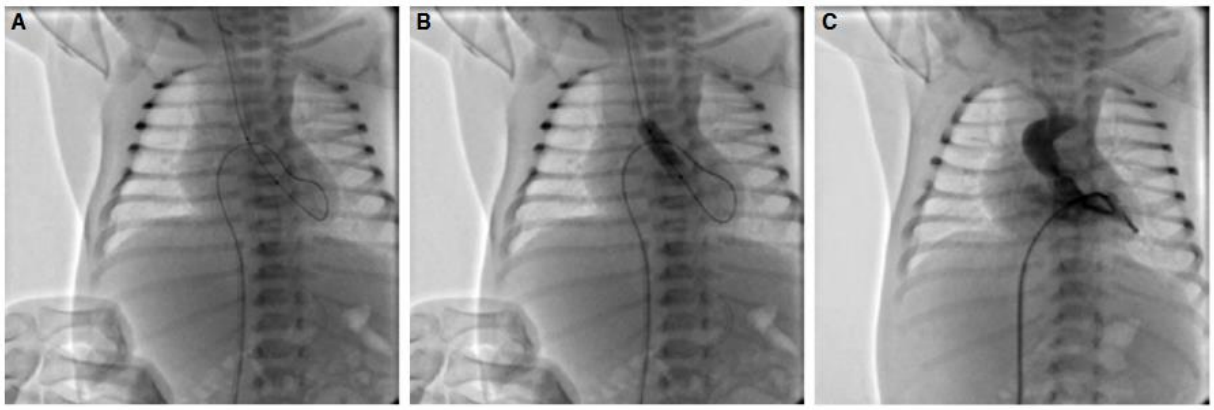

Figure 1. (A) Using umbilical vein access the catheter was passed through foramen ovale into left ventricle. **(B)** The procedure of balloon valvuloplasty iis seen. **(C)** Left ventricular injection performed after valvuloplasty procedure demonstrated decrease in presure gradient across aortic stenosis, radiological improvement, and a mild degree of aortic insufficiency

Right carotid artery access through direct surgical "cut-down" procedure also prevents femoral artery injury. Besides this approach facilitates backward blood flow from aortic valve. This procedure can be applied with the aid of transesophageal echocardiography.[11]

In conclusion, access through umbilical artery, and vein should be considered in the balloon dilatation of the critical aortic stenosis of neonate. Procedures using available catheters are safe, simple, and effective even in babies weighing less than 2.5 kg.

Conflict of interest: None declared

REFERENCES

1. Lababidi Z, Wu JR, Walls JT. Percutaneous balloon aortic valvuloplasty: results in 23 patients. Am J Cardiol 1984;53:194–7. **Crossref**
2. Rocchini AP, Beekman RH, Ben Shachar G, Benson L, Schwartz D, Kan JS. Balloon aortic valvuloplasty: results of the Valvuloplasty and Angioplasty of Congenital Anomalies Registry. Am J Cardiol 1990;65:784–9. **Crossref**
3. O'Connor BK, Beekman RH, Rocchini AP, Rosenthal A. Does early restenosis occur after aortic balloon valvuloplasty in childhood? (abstr). Circulation 1989;80(suppl II):II–593.
4. Fellows KE, Radtke W, Keane JF, Lock JE. Acute complications of catheter therapy for congenital heart disease. Am J CardioI 1987;60:679–83. **Crossref**
5. Sink JD, Smallhorn JF, Macartney FJ, Taylor JF, Stark J, de Leval MR. Management of critical aortic stenosis in infancy J Thorac Cardiovasc Surg 1984;87:82-6.
6. Bove EL, Iannettoni M, Frommelt P. Experience with critical aortic stenosis in the neonate: open vs closed valvotomy (abstr). Circulation 1989;80(Suppl I):II-68.
7. Beekman RH, Rocchini AP, Andes A. Balloon valvuloplasty for critical aortic stenosis in the newborn: infuence of new catheter technology J Am Coll Cardiol 1991;17:1172-6.
8. Podnar T, Berden P, Vesel S. Balloon dilation of neonatal critical aortic valvar stenosis via the umbilical artery. Cardiol Young 2009;19:278–81. **Crossref**
9. Kim DW, Raviele AA, Vincent RN. Use of a 3 French system for balloon aortic valvuloplasty in infants. Catheter Cardiovasc Interv 2005;66:254-7. **Crossref**
10. Magee AG, Nykanen D, McCrindle BW, Wax D, Freedom RM, Benson LN. Balloon dilation of severe aortic stenosis in the neonate: comparison of anterograde and retrograde catheter approaches. J Am Coll Cardiol 1997;30:1061-6. **Crossref**
11. Fischer DR, Ettedgui JA, Park SC, Siewers RD, del Nido PJ. Carotid artery approach for balloon dilation of aortic valve stenosis in the neonate: a preliminary report. J Am Coll Cardiol 1990;15:1633-6. **Crossref**

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