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Cordocentesis outcomes of tertiary care services in Manisa city: a retrospective analysis of four years

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Abstract

Objective: It is aimed to evaluate the outcomes of cordocentesis interventions performed for karyotyping in our clinic between 2009 and 2012.

Methods: The data of 59 patients who had cordocentesis for genetic analysis due to various indications between 2009 and 2012 were analyzed retrospectively.

Results: Out of 59 patients, the tissue culture was successful in 52 cases. The culture success rate in cordocentesis was detected as 88.1%. The mean week of gestation at the cordocentesis period was 26.55±3.75. Out of the 52 cases with successful tissue culture, chromosomal disorders were detected in 11.5% (6/52 cases). Ventriculomegaly was the most common indication of cordocentesis (24/59). The second most common indication was neural tube defect found in 11 cases (18.6%). The other indications were hydrops fetalis (13.6%), skeletal dysplasia (11.9%), and cardiac anomalies (8.5%). There was no complication following cordocentesis.

Conclusion: Cordocentesis has been commonly performed with the use of high-resolution ultrasonography devices. It can be applied from 18 weeks of gestation until term gestation. Cordocentesis should be preferred especially for the pregnancies admitted during late gestations and needed rapid results of karyotyping. It must be kept in mind that the risk of fetal demise is approximately 1.2-4.9% following the procedure and the success of cordocentesis varies between 85 and 98.4% depending on the experience of the clinician.

Keywords: Cordocentesis, karyotype analysis, ventriculomegaly, hydrops fetalis, skeleton dysplasia, cardiac anomaly.

Özet: Manisa ili üçüncü basamak kordosentez sonuçları: Dört yıllık retrospektif analiz

Amaç: Çalışmanın amacı 2009-2012 yılları arasında kliniğimizde karyotip tayini amaçlı yapılan girişimsel işlemlerden kordosentezlere ait sonuçları değerlendirilmektir.

Yöntem: 2009-2012 yılları arasında değişik endikasyonlarla karyotip tayini amaçlı kordosentez yapılan 59 olgunun verileri retrospektif olarak değerlendirildi.

Bulgular: Gerçekleştirilen 59 kordosentez girişiminden, 52'sinde doku kültürü başarılı oldu. Kordosentezde kültür başarı oranı %88.1 olarak tespit edildi. Ortalama gebelik haftası 26.55±3.75 olarak bulundu. Üreme tespit edilen olgularda %11.5 oranında kromozom anomalisi tespit edildi (6/52). Endikasyon olarak en büyük dilimi, ventrikülomegali saptanan olgular oluşturdu (24/59). Bu endikasyonu; %18.6 ile nöral tüp defekti saptanan olgular izledi (11/59). Diğer endikasyonlar ise %13.6 hidrops fetalis, %11.9 iskelet displazisi, %8.5 kardiyak anomalilerdi. Kordosentez sonrası 59 olgunun hiçbirinde komplikasyon yaşanmadı.

Sonuç: Kordosentez uygulanması, yüksek çözünürlüklü ultrasonografi cihazlarının kullanılması ile oldukça yaygınlaşmıştır. Genellikle 18. gebelik haftasından terme kadar uygulanabilen bir yöntemdir. Özellikle ileri gebelik haftasında başvuran ve hızlı karyotipleme gerektiren olgularda tercih edilmelidir. Kordosentez işlemi sonrasında fetal kayıp riskinin %1.2-4.9 arasında değiştiği ve kordosentez işleminin başarısının, işlemi yapan hekimin tecrübesine bağlı olarak %85-98.4 arasında değiştiği unutulmamalıdır.

Anahtar sözcükler: Kordosentez, karyotip analizi, ventrikülomegali, hidrops fetalis, iskelet displazisi, kalp anomalisi.

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Introduction

Cordocentesis is an invasive prenatal diagnosis and treatment method which can be applied from 14 weeks of gestation up to term gestation, enables the early diagnosis of intrauterine genetic, metabolic, infectious and hematologic diseases during prenatal period and the treatment in appropriate cases.[1]

High rates of fetal losses were reported in cases who had cordocentesis especially before 18 weeks of gestation.[2] Following its first practice together with ultrasonography in 1984, it became popular when fetus blood was used for the determination asphyxia, infection and particularly karyotyping.[3] Cordocentesis is a method which can be applied easily under sterile conditions without any hospitalization, and there is no need for medication and local anesthesia to provide maternal sedation and to decrease fetus movements.[4] Diagnostic cordocentesis has various indications such as blood diseases (coagulopathy, hemoglobinopathy), fetus infections (TORCH group infections), fetal hemolytic diseases (anti-D, Kell isoimmunisation), fetal acid-base, blood gases, pH determination and rapid karyotyping, chorionic villus sampling or mosaicism in amniocentesis cultures, fetal anatomic malformations, non-immune hydrops fetalis, intrauterine growth retardation, late referral of patient and amniocentesis with no result.

Our aim in this study is to evaluate our success in obtaining culture after cordocentesis interventions for karyotyping purposes applied in the last four years at our university which is the only tertiary care service in Manisa city, the distribution of our cordocentesis indications and feto-maternal complications.

Methods

Fifty-nine pregnant women who had cordocentesis for prenatal diagnostic karyotyping between 2009 and 2012 in the Division of Perinatology, Faculty of Medicine, Celal Bayar University were evaluated retrospectively in terms of invasive indications, fetal prognosis, cell culture success and genetic outcomes. As a standard procedure, all cases and their spouses were verbally informed about the procedure technique and possible complications before cordocentesis. Then, the cases filled up informed consent forms before the procedure. All cases were evaluated in terms of Rh incompatibility. Voluson 730 (GE Healthcare, Milwaukee, WI, USA) 3.5 MHz transabdominal probe was used for the procedure. Following systematic and detailed ultrasonographic examination and placental localization, the procedure was carried out at 21-22 weeks of gestation with 22 Gauch needle by following classical cordocentesis rules and under sterile conditions without any maternal sedation. 2 cc of fetal blood was drawn into the injector which already had 0.5 cc heparin inside. The cases that had Rh incompatibility were administered 300 µg anti-D ampoule intramuscularly in a single dose. The fetal losses and maternal complications which occurred within three weeks following the procedure were considered as the complications of the procedure.

Fetal cord blood taken at an appropriate amount from cordocentesis material which was directed to medical genetic laboratory was cultured at 37 °C for 72 hours within 5 ml basal medium (RPMI 1640) supported with 20% fetal bovine serum, 2% L-glutamine, 1% penicillin / streptomycin mixture and mitosis-stimulating fitohemagglutinin. After the culture, the metaphases obtained by giemsa-tripsine banding after preparation of harvested samples were analyzed. At least 20 metaphase fields for each sample were examined in terms of numerical and structural chromosomal anomalies, and the results were reported complying with ISCN nomenclature.

Results

The mean age of all 59 cases that had cordocentesis was found as 28.52±5.78 years (ranging between 17 and 43 years). The mean week of gestation was 26.55±3.75 (between 21 and 32 weeks of gestation). Out of 59 amniocentesis procedures performed, tissue culture was successful in 52 cases. The success rate of culture in cordocentesis was found as 88.1%. Chromosomal disorders were detected in 11.5% of the cases with successful tissue culture (6/52). The most common indication among the cases was ventriculomegaly (24/59). This indication was followed by the neural tube defect found in 18.6% of the cases (7/59). The other indications were hydrops fetalis (13.6%), skeletal dysplasia (11.9%), and cardiac anomalies (8.5%) (atrioventricular septal defect in 3 cases, transposition of the great arteries in 1 case, and ventricular septal defect in 1 case). Cordocentesis indications are given in the **Table 1**.

By the karyotyping procedure carried out, trisomy 21 was detected in the cord blood of 4 cases, trisomy 18 in one case, and Turner mosaicism (45,XO + 46,XY) in

one case. Karyotyping result was 46,XY for 26 cord blood samples, and 46,XX for 20 cord blood samples. The results of karyotyping analysis are given in **Table 2**. No maternal and fetal complication was observed in all 59 cases after the cordocentesis.

Discussion

A cordocentesis needle is used for cordocentesis which is 20-25 Gauge in diameter and 12-15 cm in length. Before the procedure, ultrasonographic examination should be carried out and fetal cardiac activity and anomaly type and presence, positions of fetus and umbilical cord, placental localization and amniotic fluid amount should be determined. For the insertion spot to the umbilical cord, an area very close to the placental insertion site of umbilical cord (for a few centimeters only) should be preferred. If it is not possible to insert through an area close to placental insertion site due to various reasons such as placental localization, fetal position and amniotic fluid amount, free section of umbilical cord or areas close to fetal insertion site should be preferred.[5] In cases where umbilical vein diameter is wider, wall thickness is small and also the possibility of fetal bradycardia in arterial interventions, umbilical vein should be preferred for the procedure.[6] It has been reported that the cordocentesis practiced in a single try is a reliable procedure in terms of hemodynamic changes in fetus.[7] There is no need to use prophylactic antibiotic after cordocentesis.[8] Mothers who have Rh incompatibility should be given anti-D immuneglobulin after cordocentesis.[9]

In cordocentesis interventions, fetal complications such as fetal loss, premature rupture of membrane, preterm labor, intraamniotic bleeding, fetal bradycardia, hematoma-thrombosis of umbilical cord and feto-maternal transfusion as well as maternal complications such as chorioamnionitis, and adult-type respiratory distress syndrome may be observed.[10,11] It is known that fetal mortality may be higher in problematic pregnancies due to interventional procedure, and general mean rate is considered as between 1.2 and 4.9%.[12,13] It should be noted that the success of cordocentesis procedure varies between 85 and 98.4% depending on the experience of clinician. In our study, no fetal loss and maternal complication was observed after the cordocentesis procedure, and cord blood could be taken in all 59 cordocentesis procedures.

Table 1. The distribution of cordocentesis cases according to the indications.

Indication	n=59	%
Ventriculomegaly	24	40.6
Neural tube defect	11	18.6
Hydrops fetalis	8	13.6
Skeletal dysplasia	7	11.9
Cardiac anomaly	5	8.5
Diaphragmatic hernia	2	3.4
Corpus callosum agenesis	1	1.7
Risk increase at second trimester screening test	1	1.7

Table 2. Distribution of karyotype analysis results in cordocentesis.

Karyotype analysis	n=52
Trisomy 21	4
Trisomy 18	1
Mosaic Turner	1
46,XX	20
46,XY	26

Although the rate of unsuccessful cordocentesis cell culture is very rare, our success rate for cell culture was found as 88.1%. In the study performed by Yıldırım et al., this rate was 94.1%.[14] It has been found out that the low rate of culture success is caused by laboratory errors. These patients were informed and it was recommended to have cordocentesis again at further weeks of gestation. Four of current 7 patients accepted a second cordocentesis and their results were evaluated as normal karyotype. The patients who had second cordocentesis procedure were excluded from the results of this study.

In our study, the anomalies which were detected mostly by ultrasonography were observed as cordocentesis indication. Detailed ultrasonography is carried out between 19 and 23 weeks of gestation at our clinic. Most of our cases are the patients who referred to our clinic at these weeks of gestation and found to have anomaly. However, since our center is a reference institution in the region and some anomalies appeared at advanced weeks of gestation (such as skeletal dysplasia), there are also the cases who had cordocentesis for karyotype analysis purposes at advanced weeks of gestation. In our study, there was only one case that had cordocentesis due to the risk increase at second trimester screening test, as the test result was reached to us at 22 weeks of gestation due to the patient.

Conclusion

Cordocentesis procedure has become widespread with the use of high-resolution ultrasonography devices. Although it requires high level of experience, it is a method which can be carried out beginning from 18 weeks of gestation up to the delivery. In the cases which especially refer at advanced weeks of gestation, require rapid karyotyping and have indication(s), experienced physicians should be preferred for cordocentesis.

Conflicts of Interest: No conflicts declared.

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