Embryo reduction: our experience

Lt Col Pankaj Talwar, VSM*, Brig RK Sharma, VSM*, Lt Col Sandeep K#, Shashi Sareen**, Col BS Duggal**

ABSTRACT

BACKGROUND

The transvaginal ultrasound-guided embryo reduction technique is a feasible option for the prevention and management of the medical and obstetric risks associated with high-order multiple pregnancy resulting from assisted reproductive treatment.

METHOD

Multifoetal pregnancy reduction was carried out in 51 in vitro fertilisation pregnancies (IVF) and one intrauterine quintuplet pregnancy resulting from intrauterine insemination (IUI) using transvaginal approach under ultrasonographic guidance.

RESULTS

Of the 52 embryo reduction procedures, 48 (92%) were performed between the seventh and eighth weeks of gestation, three between eighth and ninth weeks and one in the 10th week of gestation. Forty-nine patients (94%) underwent reduction from triplets to twins, two from quadruplet to twins, and one from quintuplet to twin pregnancy. The average time required for the embryo reduction was 5.0 ± 0.5 minutes per sac in early gestation (6th–9th weeks), increasing to 8.5 minutes per sac for later procedures, due to technical difficulties brought about by increased embryo size and mobility. All embryo reduction procedures were successfully performed in a single session.

CONCLUSION

Transvaginal ultrasound guided embryo reduction technique performed between seventh and eighth-weeks of gestation is an effective and safe procedure for embryo reduction.

MJAFI 2011;67:241–244

Key Words: assisted reproductive technology; embryo reduction

INTRODUCTION

The incidence of multifoetal pregnancy has increased in couples using exogenous gonadotrophins or clomiphene citrate.

*#Classified Specialists (Obst and Gynae), ART Centre, AH (R & R), New Delhi – 10, *Consultant (Obst and Gynae), CH (SC), Pune, **RFWMO (Retd) (HQ Region), O/o DGAfMS, M Block, New Delhi, **Senior Advisor (Obst and Gynae), AH (R & R), New Delhi – 10.

Correspondence: Lt Col Pankaj Talwar, VSM, Classified Specialist (Obst and Gynae), ART Centre, Army Hospital (R & R), New Delhi – 10.
E-mail: pankaj_1310@yahoo.co.in

Received: 07.06.2010; Accepted: 31.03.2011
doi: 10.1016/S0377-1237(11)60050-6

This increase in multifoetal pregnancy has been from 1.25% in spontaneous pregnancies to 5–8% with clomiphene induced cycles^{1,2} and is nearly 30% in patients using exogenous gonadotrophins for super ovulation for sub-fertility.^{3–6} Various measures have been taken to reduce the incidence of multifoetal gestation by making single embryo transfer the norm.^{7,8}

Multiple pregnancies being high-risk pregnancies are frequently complicated by preterm delivery, low birth weight, pre-eclampsia and increased perinatal morbidity and mortality.^{9,10} Such patients also require more operative interference and prolonged hospital stay for both the mother and the preterm baby thus mounting hospital expenditures.

Multifoetal pregnancy reduction, although a well tried technique for preventing the above complications, is a difficult choice for the couples in anguish, to make or agree upon.¹¹ Two-third of the couples who have to undergo this procedure suffer from acute emotional pain, stress, fear, and 20% have a feeling of guilt and anger.¹² Therefore adequate counselling is a must before undertaking this procedure.

With this primary aim of preventing the myriad complications associated with multifoetal gestation, a policy was adopted at our centre to reduce the higher order pregnancies to a twin gestation.

Multifoetal pregnancy reduction can be carried out both transvaginally and transabdominally under ultrasound guidance after proper patient selection and pre-operative counselling.^{9,13} Therefore this study was carried out to assess the efficacy of multifoetal pregnancy reduction by transvaginal route, the procedure exclusively carried out at our centre.

MATERIALS AND METHOD

Four thousand four hundred and ninety nine in-vitro fertilisation (IVF) and 7142 intrauterine insemination (IUI) cycles were carried out at this centre till December 2009 with successful outcome in 1630 IVF cycles and 1421 IUI procedures. Embryo reduction was carried out in 52 cases of triplets or higher order pregnancies.

Out of the above, 49 patients had triplet pregnancy, two had quadruplet pregnancies, and one quintuplet pregnancy which resulted from IUI. Multifoetal pregnancy reduction was carried out with aim of having two live fetuses after the procedure. Being IVF pregnancies these were diagnosed very early, at 5–6 weeks of gestation. All the patients were offered luteal support with micronized progesterone. Patient and relatives were counselled and preanaesthetic check-up was carried out. Each patient was informed about the potential risks of the technique and written consent was obtained before the procedure was carried out.

Figure 1 6.5 MHz transvaginal ultrasound transducer with the embryo reduction needle.

Figure 3 Intra-operative scan showing needle at the most accessible sac.

Figure 2 Cook's embryo reduction needle with trocar and cannula.

Figure 4 Needle in the most accessible sac.

The procedure was generally executed between the seventh and eighth week of pregnancy as foetuses are less mobile at this time and spontaneous resolution if any, would have had occurred by this time.

Procedure was carried out under general anaesthesia using propofol (1%). Patients were placed in a lithotomy position and vagina cleaned with povidone iodine (5%) and a single injection of antibiotic prophylaxis (cefotaxime 1000 mg intravenously) was administered. The embryos were then visualised using a 6.5 MHz transvaginal ultrasound transducer (Sonoace 5500) in order to verify their number, position, size and cardiac activity (Figure 1). Cook's ultrasound injection needle (Devroy-Tournaye-Bollen) transvaginal was used for the procedure (20 gauge and length of 35 cm along with trocar and cannula of 17 gauge and length 30 cm) (Figure 2).

Under direct ultrasonographic guidance, using a sterilised vaginal probe, embryo reduction needle trocar was inserted through the posterior or lateral fornix. The needle was advanced with brisk movement through the vaginal fornix and the uterine wall,

into the nearest easily accessible sac (Figures 3 and 4). Exact alignment between the needle and the ultrasound screen guide was necessary to perform the procedure with accuracy.

Trocar was removed and the injecting needle tip was positioned close to the embryo and then introduced into the thorax of the embryo (site of cardiac pulsation) and 0.4–0.8 mL of potassium chloride (KCl) 15% w/v (2 mEq/mL) was injected (Figure 5). Immediate embryonic death resulted, caused by the combined effect of mechanical trauma and KCl instillation. The cessation of heart activity was checked 5–10 minutes after the procedure and again 24 hours and a week later. Total duration of the procedure was approximately 10 minutes which was similar to studies carried out by other workers.¹⁴ A new needle was used each time an insertion was made through the vaginal wall. However, if the location of the sacs permitted, the additional sacs were penetrated with the same needle without reinserting it through the vaginal mucosa.

Deliberate attempt was made to ensure that foetuses, which were close to the probe and were smaller in size were reduced and

Figure 5 Tip of the embryo reduction needle is seen in the thorax of the embryo while potassium chloride is being injected.

sacs near the lower part of the uterus were avoided to prevent ascending infection. Entry from one sac to another was also avoided.

No postoperative tocolytics were given. Micronized progesterone was continued till 70 days from the day of ovum pickup. Patients were discharged after 48 hours if the absence of foetal cardiac activity in the reduced foetus was confirmed and viability of the remaining foetuses ensured. The first ultrasound was carried out after one week. All patients underwent routine antenatal follow-up subsequently.

RESULTS

The average age of the patients was 28 ± 3.5 years. Of the 52 embryo reduction procedures, 48 (92%) were performed between the seventh and eighth weeks of gestation, three between eighth and ninth week and one in the 10th week. Forty-nine women (94%) underwent reduction to twins, two from quadruplet to twins, and one from quintuplet to twin pregnancy. The average time required for the embryo reduction was 5.0 ± 0.5 minutes per sac in early gestation (sixth to ninth weeks), increasing to 8.5 minutes per sac for later procedures, due to technical difficulties brought about by increased embryo size and mobility. All embryo reduction procedures were successfully performed in a single session.

There were two patients who had complete abortion following embryo reduction. These were both triplet pregnancies, which were reduced to twin gestation giving us a complication rate of 3.8%.

The other patients were managed as normal post-IVF pregnancies and no procedure-related adverse outcome was reported.

DISCUSSION

The use of fertility medication and assisted reproductive techniques is known to result in multifoetal pregnancies. When multifoetal pregnancies occur despite the precautionary measures, embryo reduction seems a reasonable solution.

However, where triplets are concerned, it is uncertain whether embryo reduction necessarily improves pregnancy outcome. Various approaches and techniques for reduction of high-order multifoetal pregnancies have been reported like transcervical aspiration of the gestational sac, transvaginal embryo reduction, and multifoetal embryo reduction carried out transabdominally.

Transcervical aspiration of the gestational sac may be associated with an increased incidence of abortions due to infection introduced from the cervix or cervical incompetence brought about by cervical dilatation and is therefore not recommended.¹⁵ We did use a single dose of peri-operative antibiotic although the procedure was done transvaginally but this has not been followed by many other authors.¹⁶

Transvaginal embryo reduction although carried out in many centres due to their learned technical skill, multifoetal embryo reduction carried out transabdominally has been found to be safer and simpler technique than the transvaginal method.¹⁶ Considering the relatively high incidence of vanishing twins¹⁷ concern is sometimes raised about the outcome of the procedure as we may end up, losing even the viable pregnancies after the procedure is performed. However, there is very low pregnancy wastage after the heartbeat has been established.¹⁸

Multifoetal embryo reduction can be performed transabdominally under ultrasound guidance between 11 and 14 weeks of gestation. By this time gross structural abnormalities can be ruled out.¹⁹ Unfortunately the procedure is associated with higher incidence of abortion. The technique involves injection of sodium chloride (NaCl) or KCl solution near to or inside the foetal heart.²⁰ The method entails a greater technical difficulty, with miscarriage rates ranging from 10.6% to 40% and pre-term labour ranging from 20% to 64% of the cases.²¹

The major complication after embryo reduction is miscarriage. The rate of miscarriage after embryo reduction varies from 4% to 33%.²² There were two abortions in our study group leading to an abortion rate of 3.8%. We had used potassium chloride in our study though 0.9% sodium chloride has also been used in few other studies.¹⁷ Care has to be taken while using KCl. If the KCl solution accidentally reaches the amniotic fluid of the remaining embryos, this could result in a total pregnancy loss.²³

We carried out single intra-thoracic puncture technique for injecting KCl. Partial or total embryo tissue and/or amniotic fluid aspiration can also be carried out; however, it adds to technical difficulties by prolonging the surgery. Furthermore, these factors might make it difficult to visualise embryonic heart activity throughout the entire procedure. Also, it is possible that amniotic fluid aspiration may favour trophoblastic detachment.²⁴ Single puncture of the intra-thoracic embryo region until cardiac arrest is verified decreases surgery time and the risks of excessive manipulation (bleeding, infection, contractions of the uterus).

Ibérico et al in their multifoetal reduction study on 149 patients had low rates of infection (1.34%), miscarriage (7.4%), and spotting (11.4%).²⁵ All cases of spotting were self-contained in the following week with rest, without affecting the outcome of the pregnancy. There was no case of postoperative infection, miscarriage or spotting in our study.

CONCLUSION

Transvaginal ultrasound guided embryo reduction technique performed between seventh and eighth weeks of gestation is an effective and safe procedure for embryo reduction with world-wide loss rate of 4.7%.²⁶ It is a simple procedure with minimal risk to the surviving foetuses and is devoid of any risk to the maternal well-being. Multifoetal reduction may significantly reduce the risk of prematurity and low birth weight, and may be associated with reduction in overall pregnancy loss.^{4,7}

Intellectual Contributions of Authors

Study concept: Lt Col Pankaj Talwar, VSM, Shashi Sareen

Drafting and manuscript revision: Lt Col Sandeep K

Study supervision: Brig RK Sharma, VSM, Col BS Duggal

REFERENCES

1. Schenker JG, Yarkoni S, Granat M. Multiple pregnancies following induction of ovulation. *Fertil Steril* 1981;35:105.
2. Correy JF, Marsden DE, Schokman EC. The outcome of pregnancy resulting from clomiprene induced ovulation. *Aust N Z Obstet Gynaecol* 1982;22:18.
3. Gleicher N, Oleske DM, Tur-Kaspa. Reducing the risk of high order multiple pregnancy after ovarian stimulation with gonadotrophins. *New Engl J Med* 2000;343:2.
4. The ESHRE Capri Workshop Group. Multiple gestation pregnancy. *Hum Reprod* 2000;15:1856–1864.
5. Papageorgiou AT. Ethical considerations in embryo-reduction. *Current Obstetrics and Gynaecology* 2006;16:181–184.
6. Russell RB, Petrini JR, Damus K, et al. The changing epidemiology of multiple births in the United States. *Obstet Gynecol* 2003;101:129–135.
7. Yaron Y, Bryant-Greenwood PK, Dave N, et al. Multifetal pregnancy reductions of triplets to twins: comparison with non-reduced triplets and twins. *Am J Obstet Gynecol* 1999;180:1268–1271.
8. Update on Multifoetal Pregnancy Reduction. ACOG Committee Opinion 369 June 2007.
9. American College of Obstetrics and Gynaecologists. *Special Problems of Multiple Gestation: Educational Bulletin*, Washington DC 1998.
10. Tabsh KM. Transabdominal multifetal pregnancy reduction: report of 40 cases. *Obstet Gynecol* 1990;75:739–741.
11. Sentilhes L, Audibert F, Dommergues M, et al. Multifetal pregnancy reduction: indications, technical aspects and psychological impact. *Presse Med* 2008;37:295–306.
12. Berkovitz RL, Lynch L, Stone J. The current status of multifetal pregnancy reduction. *Am J Obstet Gynecol* 1996;174:1265.
13. Xu C, Xu J, Gao H, Huang H. Triplet pregnancy and successful twin delivery in a patient with congenital cervical atresia who underwent transmyometrial embryo transfer and multifetal pregnancy reduction. *Fertil Steril* 2009;5:1958e1–1958e3.
14. Mansour RT, Aboulghar MA, Serour GI, et al. Multifetal pregnancy reduction. Modification of the technique and analysis of the outcome. *Fertil Steril* 1999;7:380–384.
15. Dommergues M, Nis I, Mandelbrot L. Embryo reduction in multifetal pregnancies after infertility therapy. *Fertil Steril* 1991;55:805–811.
16. Timor-Tritsch IE, Bashiri A, Monteagudo A, Rebarber A, Arslan AA. Two hundred ninety consecutive cases of multifetal pregnancy reduction: comparison of the transabdominal versus the transvaginal approach. *Am J Obstet Gynecol* 2004;191:2085–2089.
17. Stone J, Belogolovkin V, Matho A, Berkowitz RL, Moshier E. Evolving trends in 2000 cases of multifetal pregnancy reduction: a single-center experience. *AJOG* 2007;394e1–394e4.
18. Landy HJ, Keith LG. The vanishing twin: a review. *Human Reprod update* 1998;4:177.
19. Gonen R, Heymen E, Aszatalos EV, Ohlson A. The outcome of triplet, quadruplet and quintuplet pregnancies managed in prenatal unit. *Am J Obstet Gynecol* 1990;162:424–429.
20. Lipitz S, Schulman A, Zalel Yseidman DS. A comparative study of multifetal pregnancy reduction from triplet to twins in the first versus early second trimester after detailed fetal screening. *Ultrasound Obstet Gynecol* 2001;18:35.
21. Lynch L, Berkowitz RL, Chitkara U. First trimester transabdominal multifetal pregnancy reduction: a report of 85 cases. *Obstet Gynecol* 1990;75:735–738.
22. Shalev J, Frenkel Y, Goldenberg M, et al. Selective reduction in multiple gestations: pregnancy outcome after transvaginal and transabdominal needle-guided procedures. *Fertil Steril* 1989;52:416–420.
23. Berkowitz R, Lunch L, Chitkara U. Selective reduction of multifetal pregnancies in the first trimester. *N Engl J Med* 1988;318:1043–1045.
24. Vauthier-Brouzes D, Lefebvre G. Selective reduction in multifetal pregnancies: technical and psychological aspects. *Fertil Steril* 1992;57:1012–1016.
25. Ibérico G, Navarro J, Blasco L, Simón C, Pellicer A. Embryo reduction of multifetal pregnancies following Assisted Reproduction Treatment: a modification of the transvaginal ultrasound-guided technique. *Human Reproduction* 2000;15:2228–2233.
26. Stone J, Ferrara L, Kamrath J, et al. Contemporary outcomes with the latest 1000 cases of multifetal pregnancy reduction (MPR). *Am J Obstet Gynecol* 2008;199:406.e1–406.e4.