Ascites ultrafiltration and concentration-reinfusion in severe ovarian hyperstimulation syndrome

Introduction

Mild forms of ovarian hyperstimulation syndrome are common in women undergoing in-vitro fertilization, affecting up to 33% of in-vitro fertilization cycles; 3–8% of cycles are complicated by moderate or severe ovarian hyperstimulation syndrome (Royal College of Obstetricians and Gynaecologists, 2006). To treat severe ovarian hyperstimulation syndrome, albumin and other colloid solutions are used intravenously to increase the perfusion pressure (Manaka et al, 1995; Balasch et al, 1996), heparin to restore coagulation (Balasch et al, 1996) and dopamine to increase renal blood flow (Brinsden et al, 1995), but these all have limited effects.

Paracentesis (Ferraretti et al, 1992), concentrated ascites reinfusion (Al-Shawaf and Grudzinskas, 2003), peritoneovenous shunting (Fukaya et al, 1994) and aspiration of follicular fluid (Toshimitsu et al, 2000) have also been reported for the management of severe ovarian hyperstimulation syndrome. This article outlines the clinical efficacy of ascites ultrafiltration and concentration-reinfusion in the treatment of severe ovarian hyperstimulation syndrome.

Discussion

Pathology

The pathogenesis of ovarian hyperstimulation syndrome is still not fully understood. It causes increased vasopermeability, leading to reduced blood volume, thickening of the blood, electrolyte disturbances, oliguria or anuria, ascites or pleural effusion (Annick et al, 2001). Fatal conditions such as hypovolaemic shock, adult respiratory distress syndrome, liver and/or kidney failure, thromboembolism or multiple organ failure may also occur in severe ovarian hyperstimulation syndrome (Royal College of Obstetricians and Gynaecologists, 2006).

Diagnosis

The diagnostic criteria for ovarian hyperstimulation syndrome in China are consistent with the guidelines published in 2006 (Royal College of Obstetricians and Gynaecologists, 2006). Diagnosis is usually straightforward, given a history of ovarian stimulation, either by gonadotrophins or antioestrogens, followed by typical symptoms of abdominal distension, abdominal pain, nausea and vomiting. Nevertheless, alternative diagnoses should always be considered, such as a complication of an ovarian cyst (torsion, haemorrhage), pelvic infection, intra-abdominal haemorrhage, ectopic pregnancy or appendicitis. The guidelines divide ovarian hyperstimulation syndrome into six grades of severity. Based

Dr Ao Liangfei *is Doctor in the Reproductive Medical Centre, Zhongnan Hospital of Wuhan University,* **Professor Xia Liangbin** *is Associate Professor in the Department of Gynaecology,* **Professor Xu Wangming** *is Chief Doctor and* **Professor Yang Jing** *is Chief Doctor in the Reproductive Medical Centre, Renmin Hospital of Wuhan University, Wuhan 430060, China*

Correspondence to: Professor X Liangbin

Case Report 1

A 28-year-old woman, gravida 1, para 0, was admitted to the authors' centre complaining of abdominal swelling accompanied by gradually increasing chest distress over the last 5 days. The patient had been amenorrhoeic for 35 days and her menstrual cycle was regular. She was undergoing in-vitro fertilization and embryo transfer because of tubal factor infertility and two embryos had been transferred into her uterus 16 days before she presented to the authors. She was hospitalized. Her blood pressure, respiratory rate and pulse were all stable, and her abdomen was obviously swollen. A pregnancy test was positive. Ultrasound scan revealed an intrauterine gestational sac without fetal pole and cardiac activity as well as massive ascites which was 6.5 cm deep in the left iliac fossa and 4.5 cm in the right. Both ovaries were oversized: the right one was 8.5 cm×11.2 cm and the left one was 9.4 cm×10.6 cm. Pleural effusion could be detected in both thoracic cavities. Severe ovarian hyperstimulation syndrome was diagnosed.

Intravenous fluid therapy with dextran and albumin was administered immediately but had limited effects. Three days after her hospitalization, abdominal paracentesis was performed and 2300 ml of ascites was drained off, but 2 days after this the patient's signs and symptoms became worse.

The FSCLZLY-A ascites ultrafiltration therapeutic instrument was used: 8000 ml of ascites was ultrafiltered at one time and concentrated ascites was reinfused into the abdominal cavity within 2 hours. This was repeated 7 days later because she still had evident abdominal swelling: 5000 ml of ascites was ultrafiltered and reinfused within 1.5 hours. The patient recovered and an ultrasound scan 1 week later showed that the ascites was only 1.5 cm deep. Her laboratory data improved remarkably (*Table 1*). The pregnancy continued well in follow up prenatal care until term delivery.

Case Report 2

A 30-year-old woman had undergone in-vitro fertilization and embryo transplantation because of male factor infertility. Three good quality embryos were transferred. The patient was hospitalized 10 days after embryo transfer complaining of aggravated lower abdominal distension and weight gain of 3 kg. Early pregnancy was diagnosed on the tenth day after embryo transfer (blood β-human chorionic gonadotropin level was 326 IU/litre). Ultrasound scan revealed bilateral enlarged ovaries, massive ascites and mild pleural effusion. Ultrafiltration was performed as soon as she was hospitalized and 6000 ml of ascites was drawn out and ultrafiltered, then concentrated ascites was reinfused into the abdominal cavity. Intravenous infusion of dextran and albumin was given daily. After treatment, her general condition and laboratory data were remarkably improved (*Table 1*), and both ascites and pleural effusion were dramatically decreased.

Table 1. Laboratory findings

		Case 1		Case 2	
Item	**Normal value**	**Before treatment**	**After treatment**	**Before treatment**	**After treatment**
White blood cells (10^9/litre)	3.6–10.0	13.0	8.2	14.2	9.3
Haemoglobin (g/litre)	115–160	135	121	142	118
Haematocrit (%)	33.4–51.2	39.0	34.0	35.0	33.0
Total protein (g/litre)	60–80	49	60	54	63
Albumin (g/litre)	35–55	26	37	28	36
Creatinine (μmol/litre)	54–133	95	86	84	75
Urine output (ml/day)	1500–2500	1350	2400	1400	3100
Potassium (mmol/litre)	3.5–5.5	4.1	5.2	3.8	4.9
Sodium (mmol/litre)	135–145	138	147	140	151
Chlorine (mmol/litre)	90–108	102	105	99	103
Abdominal circumference (cm)	NA	88	84	83	79

on that, these two patients were diagnosed as having severe ovarian hyperstimulation syndrome.

Management

Conservative treatment for this condition includes hospitalization and correction of hypovolaemia, hypoalbuminaemia and electrolyte disturbances by infusion of crystalloids and colloids such as albumin and blood plasma (Endo et al, 2004; Royal College of Obstetricians and Gynaecologists, 2006). Additional drainage of ascitic fluid is vital in patients with acute respiratory distress or intractable pain caused by abdominal tension. In such cases, paracentesis can alleviate pain, improve respiratory function and increase diuresis, but paracentesis alone reduces levels of serum proteins and may not stop ovarian hyperstimulation syndrome from getting worse.

The rapid re-introduction of ascites and a supplement in the effective intravascular volume lead to the beneficial effects of the recovery of body fluids (Chan et al, 2004). Exogenous albumin supplementation is necessary because of the loss of proteins when ascites was produced continuously. Toshimitsu et al (2004) reported continuous autotransfusion of ascites with a peritoneo-antecubital vein shunt which maintained the concentration of plasma proteins in 18 patients with severe ovarian hyperstimulation syndrome. In these cases, the ascites was reinfused into the venous system without ultrafiltration. It was unclear whether substances such as angioactive cytokines in the ascites, which re-entered the circulation, may have led to exacerbation of ovarian hyperstimulation syndrome.

In the present cases, the authors used the ascites ultrafiltration and concentration therapeutic instrument FSCLZLY-A (Institute of Liver Diseases, Beijing Military General Hospital, China). It is a very useful medical device for refractory ascites, the improvement of renal function and prevention of infection in the abdominal cavity.

The volume of ultrafiltered ascitic fluid ranges from 4000 to 19 000 ml (mostly 6000–8000 ml) per 1.5–3 hours. The ultrafiltration and reinfusion system can remove cytokines from the ascitic fluid without losing proteins. The advantages of this technique are that the patient's own proteins and electrolytes can be reused and the cytokines eliminated. During the treatment, the patients developed shortened activated partial thromboplastin time and required heparin following treatment.

Conclusions

Autotransfusion of proteins in concentrated ascites is successful in shortening hospital stay and alleviating symptoms in patients with severe ovarian hyperstimulation syndrome. The hospital stay of both patients was 10 days shorter than that of other patients with severe ovarian hyperstimulation syndrome. BJHM

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