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Mini Review

Amniotic Fluid in Regenerative Medicine

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Abstract

Only recently amniotic fluid has emerged as a possible source of stem cells. Amniotic fluid cells of human origin proliferate rapidly and are multipotent. Hence amniotic fluid has been proposed as a source of stem cells for tissue regeneration. Regenerative medicine is an emerging field which focuses on regeneration of cells, tissues o even the entire organ.

Keywords: Amniotic Fluid; Stem Cells; Regenerative Medicine

Introduction

Human amniotic fluid is a dynamic environment, which undergoes multiple changes to sustain fetal growth and wellbeing. Amniotic fluid contains:

- Electrolytes
- Growth factors
- Proteins
- Carbohydrates
- Lipids
- Amino acids
- Pyruvates
- Lactate
- Enzymes
- Hormones [1-4].

Amniotic fluid also contains a variety of cells derived from

- Skin
- Respiratory tract
- Gastrointestinal tract
- Urinary tract [5].

The volume and composition of amniotic fluid changes drastically and the type and the number of cells detected in amniotic fluid vary considerably at different gestational ages [6,7]. Amniotic fluid stem cells are readily accessible, pose little or no ethical concerns and do not form teratomas in vivo, hence amniotic fluid derived stem cells are promising in tissue engineering and stem cell therapy [8,9].

Amniotic fluid allograft

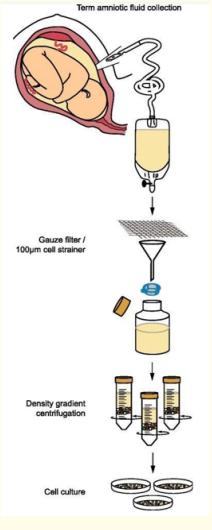

Figure 1

Procedure used to collect term amniotic fluid.

It is prepared from birth tissues donated by voluntary donors at the time of Caesarean section delivery. The amniotic fluid is retrieved and processed within 72 hours from the time of caesarean section. After disinfection of the surgical site, prior to delivery, amniotic fluid is aspirated into a sterile container using a suction catheter.

The donor should be negative for

- HBsAg (Hepatitis surface B antigen)
- HBsAb (Heptitis B core antibodies)
- HBC (Hepatitis C antibodies)
- HIV 1&2 antibodies (antibodies against human immunodeficiency virus type 1&2)
- HIVNAT (HIV - nucleic acid test)
- HCVNAT (HCV nucleic acid test).

Additional tests for communicable diseases like

- West Nile virus
- HTLV 1&2
- T. Cruzi
- Cytomegalo virus
- Epstein Barr virus.

Donor is selected based on medical and social history which meets standards of tissue banking and Federal Food and Drug Administration.

Amniotic fluid can also be collected safely during 2nd trimester routine amniocentesis (14 to 16 weeks) or 3rd trimester amnioreduction (at 28 weeks or later) besides at the time of Caesarean Section.

Clinical application

Amniotic fluid cells may be of clinical benefit for

- Fetal therapies
- Degenerative diseases
- Regenerative medicine

The amniotic stem cells have the advantages as they don't form teratomas [11]. Their increased stability and plasticity, compare to adult stem cells is also an advantage [12].

Contraindications

Active or latent infection in area of treatment.

Side effects and hazards

Alloimmunizations of recepients to the donor histocompatibility antigens may be a consequence of human allograft transplantation.

Storage

At -20 degrees or less.

Conclusion

The amniotic fluid is an underutelised source of stem cells. It has a great therapeutic potential in the field of regenerative medicine. Stem cells from amniotic fluid can be isolated and expanded easily and have the ability to differentiate into various cell types without the risk of tumorigenesis. Both amniotic stem cells and amniotic fluid mesenchymal cells have a great future in regenerative medicine.

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