Procedures

Implanting the Stem Cells

Equipment required

- 1 x Sterile drape
- 2 x 2ml syringes (for Stem Cells)
- 4 x 2ml syringes (for Local Analgesia)
- 1 x sterile arthroscopic camera sleeve (or similar)
- 1 x Intrasite Gel (or other sterile gel)
- 2 x 21G – 2 inch (50mm) needles
- 2 x 23G – 1 inch (25mm) needles
- Sterile swabs
- Local Anaesthetic (LA mepivicaine)
- Sedative (Alpha2 agonist and opiate)
- Neomycin / Penicillin (30ml sid x 3dd)
- Robert Jones Bandage material
- Ultrasound scanner
- Clippers

Figure 1
The site for analgesia of the palmar and subcutaneous nerves at the subcarpal site

Figure 2
Localizing needle in core lesion allows good spread of the cells throughout the lesion after implantation

How to implant stem cells into a tendon/ligament

Introduction

Autologous mesenchymal stem cells are implanted as a treatment of tendon and ligament injuries. The protocol for implantation of stem cells into a damaged tendon or ligament after recovery and expansion from a bone marrow aspirate is described here.

Technique

First, arrange cell delivery time with Equine Partners America by phone at (800) 752-8538 or e-mail at info@equinepartnersamerica.com. The cells should be implanted as soon as possible after arrival and therefore implantation should normally be carried out on Tuesday–Friday (to avoid delayed transit of the cells over a weekend).

- ☐ Restrain and sedate the patient with a combination of Alpha2 agonist and opiate (e.g. detomidine HCl and butorphanol).
- ☐ Clip the leg to be implanted to include subcarpal local anaesthetic sites and proximally past the accessory carpal bone.
- ☐ Clean the site with surgical scrub (eg chlorhexidine) and surgical spirit.
- ☐ Perform an ultrasonographic examination to identify the core lesion, its extent and the appropriate sites for stem cell implantation.
- ☐ Aseptically prepare the site for local analgesia.

To ensure complete desensitization of the skin overlaying the tendon and superficial digital flexor tendon, both the palmar nerves deep to the metacarpal fascia and the subcutaneous nerve supply supericial to the fascia have to be 'blocked' on either side of the limb at the subcarpal site (figure 1).

If the suspensory ligament is being treated, the palmar metacarpal nerves should also be 'blocked.

- ☐ The palmar metacarpal region should then be prepared aseptically.
- ☐ In a sterile fashion, load 2 x 2ml syringes with each of the 1ml stem cell aliquots.
- ☐ Place the ultrasound transducer in a sterile sleeve (a sterile arthroscopic camera sleeve with the end sealed can be used for this purpose). Contact between the transducer and the skin is optimized with the use of scanning gel within the sleeve and intrasite gel on the outside.
- ☐ Using triangulation of a 21G – 2 inch needle and the ultrasound transducer longitudinally 'in line' with the needle (figure 2) the needle can be visualized entering the tendon (figure 3).

Care should be taken to ensure the tip of the needle is visible ultrasonographically so that the end does not penetrate the deep surface of the tendon.

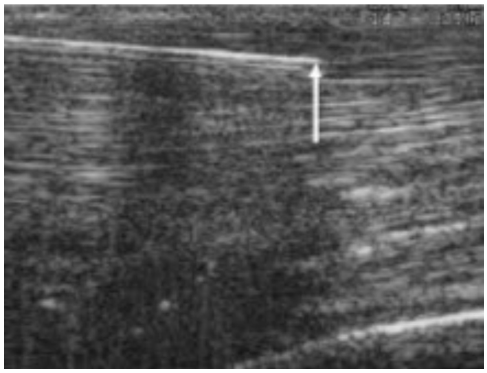

Figure 3
Visualisation of the needle entering the tendon

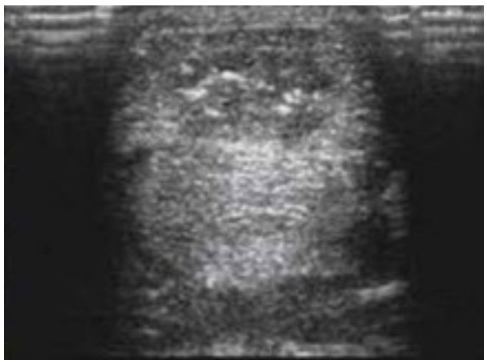

Figure 4
After injection air bubbles from the injection are present with the core lesion

The first site of injection is usually the mid-point of the lesion as this often allows good spread of the cells throughout the lesion after implantation.

- ☐ Inject the stem cells into 1–3 sites depending on the nature of the core lesion (more advanced healing requires more injection sites due to less spread).

Accurate placement is confirmed by the presence of air bubbles within (and only within) the core lesion (figure 4) which will also indicate the degree of spread.

- ☐ Bandage the limb immediately to minimize subcutaneous hemorrhage and loss of injected cells from the tendon.
- ☐ Administer intramuscular neomycin/penicillin and provide sufficient for a three day course.
- ☐ Discuss the post-operative exercise regime with the owner.

Rehabilitation Program

The advised outline rehabilitation program is shown below:

0–3 weeks	Stall rest with Robert Jones bandage then stable bandage
3–12 weeks	Building from 10 to 30 minutes walk per day
12 weeks	Ultrasound assessment
12–32 weeks	Building from 40 minutes walk and 5 minutes trot to 15 minutes walk and 30 minutes trot per day. Ultrasound assessment needed at 24 weeks.
32 weeks	Ultrasound assessment
32–40 weeks	45 minutes daily exercise including a slow canter twice weekly (building from up to 1 mile to up to 1.5 miles)
41–48 weeks	45 minutes daily exercise including one gallop three times a week (building from 3 to 6 furlongs)
48 weeks	Ultrasound assessment
49 weeks on	Full competition training

N.B. Training in weeks 32-48 is variable depending on which discipline the horse is used for.