TIPS AND TRICKS FOR ALLO AND AUTOGRFTING FOR OCD
Peter Böttcher, Prof. Dr. med. vet., DECVS
Department of Small Animal Medicine, University of Leipzig, Leipzig, Germany

Key Points:
- Except for the shoulder, osteochondral transplantation potentially allows for better functional outcome than curettage of OCD lesions.
- With mosaicplasty small core transplants from within the femoro-patellar joint can be used for autologous transplantation, while the OATS procedure is limited to the donor sites abaxial to the femoral trochlea. The latter have only very thin cartilage and weak subchondral bone density.
- Donor site morbidity when using the stifle as the donor for other joints (shoulder, elbow, hock) might be frustrating, with septic arthritis and recurrent patellar luxation being the most significant complications.
- Allografts can be stored up to 8 weeks at 5°C, retaining ≥ 75% of viable chondrocytes.
- No immunosuppressive treatment is needed when using allografts.
- With allografts orthotopic transplantation is possible, allowing for true anatomic reconstruction of the lesion, matching cartilage thickness, subchondral bone density and surface curvature perfectly.
- Correct orthogonal transplantation is the most challenging technical aspect when performing osteochondral transplantation. Using templates significantly increases surface congruence.

Treatment of OCD lesions consists of débridement of the lesion and subsequent induction of fibrocartilage healing. However fibrocartilage has no biomechanical effect on load distribution, leaving the healed defect biomechanically identical to a fresh osteochondral defect. Nevertheless, coverage of the lesion with fibrocartilage improves clinical function of the affected joint, probably because friction at the lesion site and therefore mechanical irritation of nerve endings within the denuded subchondral bone plate is reduced. Furthermore the fibrocartilage scar may act as a biological wound dressing, protecting the subchondral bone from biochemical irritants which arise from the synovial fluid.

Overall, traditional surgical treatment of OCD lesions bears a favourable prognosis only in the shoulder joint, with the exception of large centrally located lesions. Lesions affecting the elbow, the stifle and the hock are often accompanied by chronic lameness and progressive osteoarthritis. Reconstructing the lesion site using osteochondral plugs has been evaluated in dogs and subsequently used in humans since decades with great success. Today, osteochondral transplantation has gained increased popularity in (small animal) veterinary surgery and has been shown to offer good functional outcome in the shoulder, the elbow and stifle joint. Even OCD lesions affecting the talus may benefit from osteochondral grafting.

Osteochondral transfer is performed using two different concepts: (1) mosaicplasty and (2) OATS. Mosaicplasty is the traditional technique introduced by Hangody and consists of multiple osteochondral transplants with a diameter of 2.7, 3.5 and 4.5 mm, which are implanted into the lesion site, resembling to a mosaic. The technique aims for anatomical reconstruction of the local joint surface curvature and ≥ 75% hyaline cartilage coverage. The
OATS (Osteochondral Autograft Transfer System) aims for complete hyaline cartilage coverage at the lesion site using one to three transplants with diameters 6.0 to 10.0 mm, mostly in an overlapping fashion. Depending on which system is used, different donor sites are available when performing autologous transplantation (see fig. 1). With the usage of small diameter cores harvesting is feasible within the femoral trochlea, whereas with larger diameters abaxial regions of the stifle joint have to be used. The abaxial donor sites used with the OATS may not allow anatomical reconstruction of the lesion site in terms of cartilage thickness, split line pattern and subchondral bone density. Clinical evidence that one of the systems performs better than the other is not available.

Figure 1: Autologous osteochondral transplants can either be harvested within the femoro-patellar joint along the femoral trochlea or abaxially outside the trochlea. The proximo-medial aspect of the medial condyle is another region where autologous plugs can be harvested, even with large diameters up to 8 mm and more.

Osteochondral transplantation outside the stifle joint involves harvesting of osteochondral plugs within the stifle joint and transferring them to the recipient joint, such as the shoulder, elbow or hock. This bears the risk of significant donor site morbidity. Based on our personal experience, we do not longer perform autologous osteochondral transplantation for OCD lesions outside the stifle joint. Joint sepsis and recurrent patellar luxation were catastrophic side effects of transplant harvesting. Today we use allografts harvested from client owned dogs euthanized for reasons unrelated to oncology or infection. The matching joint head is harvested under surgical asepsis and stored at 5°C within a storage media. Viability of chondrocytes of ≥ 75% can be expected for up to eight weeks of storage. Transplantation is carried out similar to the autologous technique, with the exception that harvesting of the transplant(s) is performed at the exact same anatomical area to the lesion within in the recipient (orthotopic transplantation). This allows transplantation of larger plugs (6-12 mm), because surface curvature matches perfectly. However, because of the high density of the joint surface at the weight bearing regions we use the Diamond Bone Cutting System (DBCS®; ARTICOmed) for transplant harvesting, which are surgical diamond core reamers for the arthroscopic bone and cartilage transplantation. The recipient site is prepared using cannulated drills of appropriate size and the transplant is press fitted into place.

With the exception of one stifle joint exhibiting fracture of two transplanted cores (3.5 and 4.5mm) autologous transplantation within the stifle joint resulted in excellent functional outcome (mosaicplasty with transplants from the axial regions of the femoral trochlea). Radiographic osteoarthritis progressed on long-term while function remained excellent.
Second look arthroscopy ≥1 year after transplantation revealed functional hyaline cartilage. Those transplants which were implanted proud induced mild kissing lesions at the opposing joint surface without clinical consequences.

Autologous transplantation of OCD lesions affecting the shoulder or the elbow joint all resulted in excellent function, while donor site morbidity at the stifle was a significant issue, as mentioned above. As for the stifle, long-term follow-up showed excellent function and viability of the grafts, even without ulnar osteotomy. Contrary to Fitzpatrick we prefer a lateral approach to the elbow joint with osteotomy of the epicondyle to allow for perfect perpendicular transplantation. This approach allows simultaneously curettage of any form of medial coronoid disease.

Autologous grafting of talar lesions improved function but lameness especially after heavy exercise persisted. This is probably due to the suboptimal restoration of the joint contour because of lack of similarly matched donor regions.

**Figure 2**: Allograft transplantation for a centrally located OCD lesion affecting the shoulder (left shoulder, caudal to the right)

A large, centrally located OCD of the humeral head with the cartilage flap still in situ.

Situation following surgical debridement.

Harvesting of the allografts from a donor stored at 5°C.

Grafting with two 8 mm allografts. Notice the anatomical reconstruction of the physiological joint surface curvature.

**Figure 3**: Allograft transplantation for a talar OCD (left talus, medial approach, caudal to the left)

A large OCD of the medial ride of the talus.

Situation after drilling the recipient bed (8.5mm).

Harvesting the allograft from a donor stored at 5°C.

Situation after implantation. Anatomical reconstruction.
**Figure 4:** Allograft transplantation for an OCD lesion affecting humeral trochlea (right elbow, lateral approach, caudal to the left)

OCD lesion of the humeral trochlea approached though alateral arthrotomy with osteotomy of the lateral epicondyle. The lateral approach allows for orthogonal implantation technique, while implantation through a medial arthrotomy results in oblique graft implantation.

8.5mm allograft from the humeral trochlea of a similar sized dog euthanatized unrelated to the transplantation.

Situation after Implantation of the allograft. Notice the accurate reconstruction of the physiological joint contour as well as complete coverage of the lesion with healthy hyaline cartilage.

Dorsal CT image of the grafted elbow joint. The screw is used for reattachment of the lateral epicondyle. Perfect restoration of physiological joint contour was achieved even at the level of the subchondral bone.

Allografts performed equivalently well or even better than autografts with the additional benefit of absent donor site morbidity. All lesions affecting the shoulder (see fig. 2), the elbow (see fig. 4) and the hock (see fig. 3) healed uneventfully showing resilient hyaline cartilage at one year follow-up.

The use of templates to guide drilling during harvesting and recipient bed preparation is still under investigation. This technique has been shown to improve reconstruction of physiological surface curvature dramatically, being easy and cheap at the same time.

**Bibliography**