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Case Report

Amputation and prosthesis in a horse: short- and long-term complications

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Introduction

Traditionally, severe leg injury in a horse often required euthanasia, but, many of these injuries can now be treated. However, horses are still being subjected to euthanasia following severe leg injury, because of a poor long-term prognosis. Partial limb amputation and prosthesis may offer an alternative to euthanasia in selected cases. It can be more than a life-sparing procedure and enable a productive life. Mares and stallions have continued breeding following partial limb amputation (Koger 1963; Crawley *et al.* 1989; Grant 1998).

Proper candidate selection for partial limb amputation and prosthesis is of major significance. The horse must be able to adjust to the loss of support from the limb, the use of a sling and constant treatment and handling by staff and owners (Krpan *et al.* 1985; Grant 1998). The degree of commitment that owners are willing to take upon themselves is of major importance. This procedure requires intensive post operative treatment, along with investment of time and money, for the rest of the horse's life (Grant 1998).

One of the major limitations of the use of prostheses in horses is the high complication rate. However, few details are available regarding short- and long-term complications. **We report a case of partial limb amputation and prosthetic device fitting in a 20-year-old Arabian-cross stallion, including both short- and long-term complications.** To the authors' knowledge, this is the first report of partial limb amputation and prosthesis fitting in a horse in Israel.

Case details

History

A 20-year-old Arabian-cross stallion was admitted, in 1995, to the Koret School of Veterinary Medicine Veterinary Teaching Hospital (KSVM-VTH) due to chronic lameness and severe swelling of the right hindlimb. Physical examination revealed a large soft tissue swelling extending from mid-metatarsus to the foot. Radiographs revealed marked thickening of the soft tissue and bone proliferation of the lateral proximal sesamoid, which was suspected to represent an old fracture. The horse was mildly lame at a walk. Haematology was within normal values for our laboratory. The swelling was attributed to lymphatic obstruction due to either past trauma or previous infection of that region. Due to the expected costs the owner elected not to administer any specific treatment except symptomatic care, which included phenylbutazone and antibiotics for a short period, and then the horse was donated to the university. The horse's condition was stable for the next 3 years, while the diameter of the hind leg changed frequently. During that period the horse served as a blood donor and a teaser in the hospital and had been in a paddock each day walking and trotting. Secondary infections requiring local treatment occurred occasionally at the plantar area of the fetlock joint, due to constant rubbing on the ground. Lameness was attributed to the weight of the leg causing mechanical interference. The horse had a good quality of life, a regular appetite and was in good body condition.

Three years after admission, the lameness became worse, the diameter of the swelling increased and the horse injured its leg constantly while walking. The injuries were treated locally and phenylbutazone (1 g b.i.d. *per os*) was administered. However, improvement was not apparent and, since the level of lameness was severe, it seemed that the medical options were exhausted and a surgical solution or euthanasia should be considered. Radiographs of the right hindlimb revealed subluxation and hyperextension of the fetlock and a bony proliferation of the lateral splint and lateral sesamoid bones.

First surgery

The purpose of the surgery was to remove a major part of the soft tissues around the fetlock (**Fig 1**) to enable weightbearing on the leg and prevent the constant injuries due to contact between soft tissues and the ground while walking. As much

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Fig 1: Appearance of right pelvic limb at the time of initial surgical debulking of the lesion.

Fig 3: Appearance of distal aspect of right pelvic limb 18 days after surgical debulking. Note *that the hoof capsule and the third phalanx have been sloughed (**arrow indicates position of P2**).*

Fig 2: Post operative appearance of the right pelvic limb one week after surgical debulking. Note *the circumferential loss of skin and underlying granulation tissue at the distal aspect of the limb.*

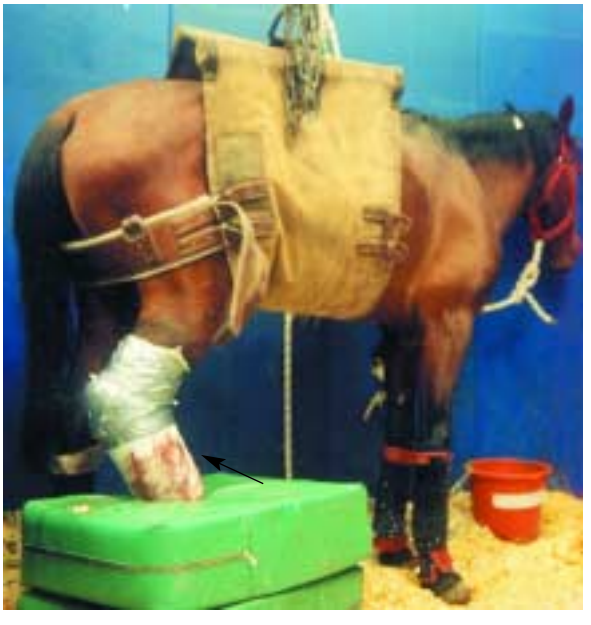

Fig 4: Post operative appearance of the horse immediately following amputation of the distal aspect of the right pelvic limb. Note *that the horse is supported by a sling. The distal aspect of the residual limb has been protected using a fibreglass cast (**arrow**).*

skin as needed for closure was retained and as much subcutaneous swelling as possible was removed. The tissue that was removed appeared fibrous and rich with lymphatic fluid, and weighed 7 kg. The leg was bandaged and a polyvinylchloride (PVC) splint applied on the plantar side in order to prevent hyperextension of the fetlock joint. A week after surgery the skin seemed less vital, and 2 days later the hoof had sloughed. No bleeding was evident from the foot and the horse was bright, alert, responsive and standing for most of the day without obvious signs of pain. Initial treatment included trimethoprim sulphadiazine (20 mg/kg bwt b.i.d. *per os*), phenylbutazone (4.4 mg/kg bwt for 2 days, then 2.2 mg/kg bwt b.i.d. *per os*) and daily bandage replacement after rinsing the leg with an antiseptic liquid (**Fig 2**). Two weeks later, following constant aggravation of the secretions and necrosis, enrofloxacin (7.5 mg/kg bwt s.i.d. *per os*) was added to the treatment regime. Three weeks after surgery, the third phalange sloughed (**Fig 3**). Other than the injured leg, the horse was in good health; therefore, amputation was suggested as an alternative to euthanasia.

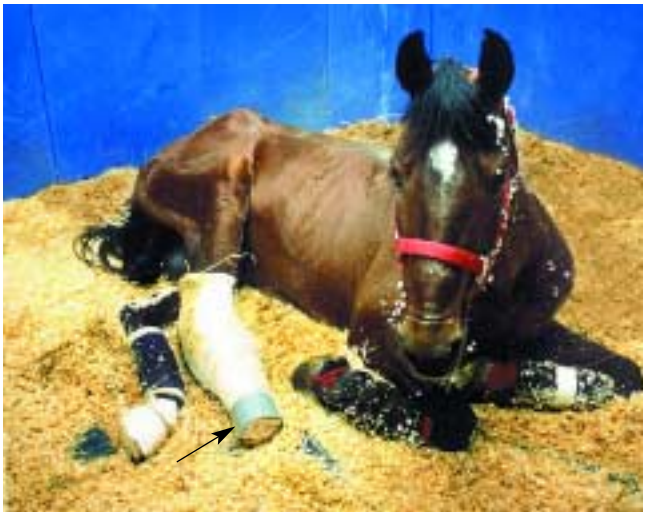

Fig 5: Post operative appearance of the horse on the day after amputation, depicting the application of a temporary PVC support (arrow).

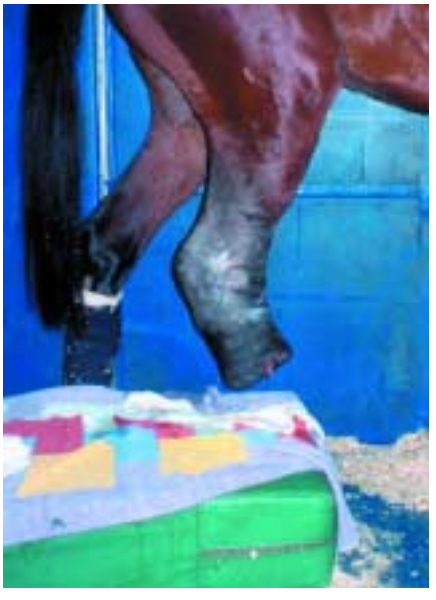

Fig 6: Appearance of the residual right pelvic limb 2 weeks after the amputation.

Second surgery

Peroneal and tibial nerve blocks were performed using mepivacaine before the surgery. Amputation of the limb was performed under general anaesthesia, 10 cm distal to the tarsometatarsal joint according to the technique described by Krpan *et al.* (1985). After the surgery, a synthetic cast was applied to the residual limb up to the level of the tarsus. Recovery was uneventful and the horse was able to stand on 3 legs while using a sling (**Fig 4**). Preventative treatment against laminitis was initiated and included frog support pads on all 3 legs, nitroglycerin (30 mg/foot) on the palmar and plantar digital arteries and phenylbutazone (4.4 mg/kg bwt i.v. b.i.d.). A temporary prosthetic device was improvised by attaching to the cast a PVC tube, which completed the length of the leg (**Fig 5**).

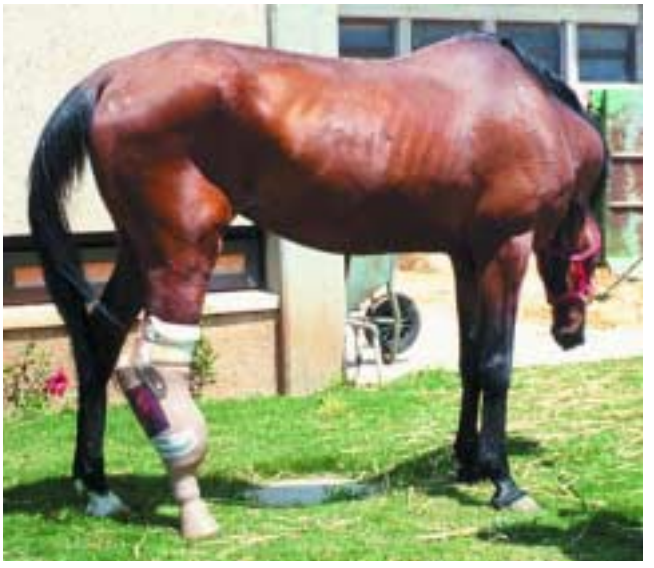

Fig 7: The horse a month after amputation, showing use of the permanent prosthesis.

Rehabilitation process

During the days following surgery, the horse was able to lie down and rise independently with ease. While standing weight was take on the prosthesis. Five days after the surgery, it was noted that the stump was producing large amounts of serous secretions. Two weeks after the surgery all sutures, except 4 that remained buried in the skin, were removed (**Fig 6**). Healing of the stump seemed to be complete, but fluid was still being secreted. Three weeks after surgery, following a few trials, a permanent prosthesis was fitted (**Fig 7**).

The socket-type prosthesis used in this case consisted of a padded sleeve, a stump cover and the prosthetic device that was made of carbon fibre. The padded sleeve was placed on the residual limb and the stump cover placed over it and attached to the prosthetic device. The horse seemed quite comfortable with the prosthesis, and lameness was less distinct than before. The prosthesis was removed on a daily basis and the residual limb examined for any abnormalities. The limb was cleaned while the stump cover was replaced with a fresh one and the prosthesis was cleaned and aired for about 15 mins. This procedure was carried out with the horse in the sling for the first few times; after this, the horse allowed us to perform the procedure safely and comfortably in the stable. The horse was walked for 10 mins b.i.d.

Three months after surgery, the horse was released in an arena for the first time and trotted for 30 mins. The next morning the horse could not bear weight on the prosthesis, and a deep wound was found at the lower plantar part of the stump. Treatment included enrofloxacin (7.5 mg/kg bwt s.i.d. *per os*), phenylbutazone (2.2 mg/kg bwt b.i.d. *per os*) and daily

cleaning of the wound. Two weeks after recovery, further deterioration in wound condition was observed. Treatment was initiated, following a sample collection for culture and sensitivity, and included trimethoprim/sulphadiazine (TMS, 20 mg/kg bwt b.i.d. *per os*) and phenylbutazone (2.2 mg/kg bwt b.i.d. *per os*). *Streptococcus β haemolytica* and *Pseudomonas auroginosa* were isolated from the sample. The latter were found to be resistant to TMS and quinolones; therefore, the antibiotic treatment was terminated. Over time, with daily cleaning and bandage changing, the wound closed completely, but there was no improvement in lameness. The horse placed little weight on the leg. Radiographs were taken in order to rule out any bony lesions, especially osteomyelitis, and ultrasound was used to rule out an abscess. After a period in which there was no satisfactory improvement, surgical exploration under general anaesthesia was performed. At surgery, 2 nylon sutures were found and removed from the stump and necrotic tissue was debrided. From this point on, a routine was observed. An abscess would form approximately every 2 months followed by lameness. Follow-up radiographs and ultrasound did not reveal any significant findings. A new silicon sock was introduced and an improvement was noted by decreasing the oedema. Pressure bandages also helped to reduce oedema formation when the horse was left without the prosthesis for a few hours at a time. During the rehabilitation process, due to ongoing changes in the size and shape of the residual limb, 2 more sockets were specially prepared for the horse. These provided a temporary improvement in gait and weightbearing on the amputated limb. Several months after the amputation, atrophy of both hindlimb muscles was marked. Later, pressure wounds occurred on the contralateral limb at the dorsal metatarsus, due to incorrect application of supporting bandages. In the next few months the horse's condition deteriorated as he had difficulty using the contralateral leg. It appeared that the supporting structure of the left 'healthy' limb had collapsed. Twenty-four months after the amputation, the horse could not rise to his feet and he was subjected to euthanasia.

Discussion

Theoretically, partial limb amputation and fitting prosthetic devices could save some horses which would otherwise be subjected to euthanasia due to severe leg injuries. Horses with chronic septic joints, osteomyelitis and open comminuted fractures have undergone this procedure (Crawley *et al.* 1989; Grant 1999). Therefore, partial limb amputation and prosthesis fitting should be discussed with owners; however, due to the high complication rate and the questionable life quality of those horses, the justifiable use of this technique is limited and should be used only as an alternative to euthanasia.

In horses, following human medicine, most reported prosthetic devices consist of sockets shaped as hollow cylinders. In all of these cases the leg was amputated distal to the carpus/tarsus, at the proximal part of the metatarsus/metacarpus (Koger *et al.* 1970; Crawley *et al.* 1989; Grant 1998). The resulting stump is long enough to enable good adjustment to the socket. In the forelimb the thickening of the carpus supports the prosthesis, whereas in the hindlimb the prosthesis is supported by the change of angle above the tarsus. The socket type of prosthesis was used in our case. Another technique involves using an interlocking intramedullary device, in which a nail is inserted through the metacarpus/metatarsus and cross pins are used to secure it in place. This method is not commonly performed, but has been used successfully (Herthel 1996; Grant 1998).

The use of rigid dressing immediately following amputation, as in the present case and in other reports on equine amputees, is well supported by the human medical literature (Shurr and Michael 2000).

One of the major limitations of the use of prosthetic devices in horses is the high complication rate. Seven out of 13 cases reported by Crawley *et al.* (1989) died or were subjected to euthanasia within 18 months after surgery, and another mare died 12 months later. Two horses foundered within the first 3 weeks post surgery and 3 other horses fractured the pelvis or ruptured the femoral head ligament 14–18 months after surgery; all were subjected to euthanasia. In man, reported complications after amputation and prosthetic fitting include sinus wound, open wound, bone infection, exostosis, oedema (with suspected underlying pathology), necrosis, neuroma, phantom pain, joint contractures and various dermatological problems, including contact dermatitis, verrucous hyperplasia, reactive hyperaemia, epidermoid cysts and superficial skin infections (Forney 1992; Engstrom and van de Ven 1999; Smith 2000). Repeated oedema formation is the most common and frustrating complication in the human amputee. Since most amputations are due to vascular diseases (mostly diabetes as an underlying cause), this fact is not surprising. According to Shurr and Michael (2000), there are cases in which there is no way to avoid repeated ulceration of the residual limb and patient management is from one episode to the next. This pattern certainly correlates well with our case. In addition, the buried sutures that were hidden under the skin for a long period may have been another source of constant irritation until they were removed surgically. In order to decrease the likelihood of these unfortunate complications, the horse must be able to lie down and rise properly with the cast or prosthetic device in place. This reduces the load on the healthy limb. Mares and geldings are considered to have a better disposition, and hence to be more likely to cooperate. The fact that the horse was a stallion but nevertheless cooperated perfectly well throughout the rehabilitation procedure is of interest.

Complete rest and a gradual and controlled exercise rehabilitation programme post operatively are of major importance. It is possible that allowing the horse to trot in the arena 3 months after the amputation was premature and resulted in deterioration in the condition due to the load carried on the prosthetic device. Repeated cyst infections and abscess formation formed the major complication in our case. The change in diameter of the stump caused different friction points, which led to repeated wound development and accumulation of serous fluid at the distal part of the stump. The frequent change in stump diameter required constant adjustment of the prosthetic device, which was costly as well

as technically difficult. This seems to be the case with human patients, in which, according to Smith (2000), the prosthetic socket must be changed at least twice in the first 18 months even with careful modifications. In man, an ill-fitting socket is a common problem which needs constant attention and still contributes substantially to poor overall functional result in rehabilitation of patients with an amputated limb (Engstrom and van de Ven 1999; Fergason and Smith 1999). In a survey by Legro *et al.* (1999) that included 92 people with lower limb amputations and prosthesis, the avoidance of local sores and other skin problems and the fit of the prosthesis were the most important factors associated with the use of the prosthesis. Collin and Collin (1995) reported that as few as 5% of human amputees use their prosthesis for more than half of their waking hours and can walk safely outdoors.

Human amputees are still waiting for development of the ideal socket. A recent study by Sanders *et al.* (2000) showed that typically different areas of the stump tend to swell at different rates and that the pressure tends to decrease with stump swelling and increases with stump atrophy. This might prove to be a beneficial area for investigation in the equine amputee.

Constant care and support of the contralateral limb proved to be crucial in the rehabilitation process. Despite continual efforts to minimise the stress on the contralateral leg, the main reason for euthanasia was collapse of the supporting structures in that limb. Analgesia with nonsteroidal anti-inflammatory drugs (NSAIDs) was required for relatively long periods and was sometimes insufficient. Constant monitoring for adverse effects such as renal failure and gastrointestinal ulcers was required due to the long period of NSAID use.

Determining the time of surgery is a matter of careful judgement. On one hand, amputating the limb after the horse has already adjusted to a nonfunctioning leg would increase the chances for a successful rehabilitation, since it would avoid unnecessary pressure on the prosthesis immediately after fitting it. On the other hand, one must operate before pathological changes have occurred systemically and in the opposite leg, mainly in the form of laminitis (Crawley *et al*. 1989; Grant 1998). In our case, the chronic lameness may have helped the horse to adjust to the prosthesis. It was accustomed to lying down and rising with only limited use of the lame leg, and hence did not put a lot of weight on the prosthetic device. The horse's light weight (about 330 kg) also limited the stress on both limbs. Another issue that is difficult to assess is the period for which the residual limb should be free from the socket and, while so, how tight and for how long should it be bandaged. In previous reports on equine limb amputees, the only period for which the horse was without the prosthesis was while it was changed, about every other day. In this case, it appeared that giving the residual limb a period (about 20 mins) in the open air, preferably in the sun, and a couple of hours in bandages, improved the skin and overall condition. In man, the prosthesis is worn only during waking hours and the residual limb is bandaged at night.

The new generation of human and equine prosthetic devices includes a shock-absorbing mechanism, which helps to reduce pressure on the stump. Unfortunately, in the present case, technical difficulties prevented the production of such a device. According to Grant (1999) this improvement has proven to be both practical and useful, especially for stallions with hindlimb prosthesis.

It is emphasised that throughout the torturous rehabilitation process the horse maintained its stallion behaviour and, as far as can be judged, was not suffering for the majority of the time.

In conclusion, in spite of the high complication rate, chronic treatment required and generally short-term survival after limb amputation and prosthesis fitting in the horse, the procedure may offer the only humane alternative to euthanasia. Denying treatment when the alternative prognosis is death causes much debate in human medicine. For most people amputation may offer an escape from constant pain and disability, while others would rather die (Donohue 1997). In veterinary medicine the decision has to be made by the owners and the veterinarians, and it must be carefully considered.

Documenting more cases is essential in order to try to draw conclusions about the prognosis, life expectancy and expected quality of life. Additional reported cases are essential in order to provide more practical knowledge and experience. These are crucial in order to address the problems mentioned in this report and to improve their solutions.

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References

Collin, C. and Collin, J. (1995) Mobility after lower limb amputation. *Br. J. Surg.* **82**, 1010-1011.

Crawley, G.R., Grant, B.D., Krapan, M.K. and Major, M.D. (1989) Long-term follow-up of partial limb amputation in 13 horses. *Vet. Surg.* **18**, 52-55.

Donohue, S.J. (1997) Lower limb amputation. 4: Some ethical considerations. *Br. J. Nurs.* **6**, 1311-1314.

Engstrom, B. and van de Ven, C. (Eds) (1999) Residual limb complications. In: *Therapy for the Amputees,* 3rd edn., Churchill Livingstone, Edinburgh. p 144.

Fergason, J. and Smith, D.G. (1999) Socket considerations for the patient with a transtibial amputation. *Clin. Orthop. Rel. Res.* **361**, 76-84.

Forney, H.J. (1992) Amputation. In: *Orthopedic Rehabilitation*, 2nd edn., Eds: V.L. Nickel and M.J. Botte, Churchill Livingstone, New York. pp 626-628.

Grant, B.D. (1998) Limb amputation and prosthesis. In: *Current Techniques in Equine Surgery and Lameness*, Eds: N.A. White and J.N. Moore, W.B. Saunders Co., Philadelphia. pp 463-468.

Grant, B.D. (1999) Amputation and prosthetic devices. In: *Equine Medicine and Surgery*, 5th edn., Eds: P.T. Colahan, A.M. Merritt, J.N. Moore and I.G.J. Mayhew, Mosby, St. Louis. pp 1406-1407.

Herthel, D.J. (1996) Application of the interlocking intramedullary nail.

In: *Equine Fracture Repair*, Ed: A. Nixon, W.B. Saunders Co., Philadelphia. pp 371-376.

Koger, L.M. (1963) Equine limb prosthesis. *Mod. vet. Pract.* **44**, 65-66.

Koger, L.M., McIlhattan, J. and Schladetzky, R. (1970) Prosthesis for partially amputated foreleg in a horse. *J. Am. vet. med. Ass.* **156**, 1600-1604.

Krpan, M.K., Grant, B.D., Crawley, G.R., Ratzlaff, M.H., Eckstein, D.T. and Held, G.K. (1985) Amputation of the equine limb: a report of three cases. *Proc. Am. Ass. equine Practnrs.* **31**, 429-444.

Legro, M.W., Reiber, G., del Aguila, M., Ajax, M.J., Boone, D.A., Larsen, J.A., Smith, D.G. and Sangeorzan, B. (1999) Issues of importance reported by persons with lower limb amputations and prostheses. *J. Rehab. res. Develop.* **36**, 155-163.

Sanders, J.E., Greve, J.M., Clinton, C. and Hafner, B.J. (2000) Changes in interface pressure and stump shape over time: preliminary results from a trans-tibial amputee subject. *Prosth. orthotics Int.* **24**, 163-168.

Shurr, D.G. and Michael, J.W. (Eds) (2000) Management of the residual limb. In: *Prosthetics and Orthotics*, 2nd edn., Prentice Hill, New Jersey. pp 88-94.

Smith, D.G. (2000) General principles of amputation. In: *Current Diagnosis and Treatment in Orthopedics*, 2nd edn., Ed: H.B. Skinner, Lange Medical Books/McGraw Hill, New York. pp 583-588.

Clinical Commentary

Amputation and prosthesis in the horse

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The case report by Kelmer *et al.* (2004) above, reporting on the amputation and fitting of a prosthesis to a horse, raises a number of practical and ethical considerations. Although a common procedure in other species, the equine fraternity are only just beginning to consider this as a possible line of treatment for horses.

Limb amputation and the fitting of a prosthesis in man is a well-established procedure. When carried out in otherwise healthy human subjects, its value is seldom questioned as a life-saving operation. The amputee is usually able to carry on a relatively normal lifestyle, and few of us know of the problems, such as pressure sores, that still occur in these human patients. Perhaps clinicians working with the 'human animal' are lucky that they do not have to bring the question of athletic performance or economic value into their clinical equation. In some older and moribund human patients, perhaps the value of amputation should be questioned. The principle of the sanctity of human life, however, generally means that almost anything that will prolong life for any period has become acceptable.

Limb amputation in cats and dogs has long been practised by veterinary surgeons, although one wonders what passed through the mind of the first man (or woman) to carry out this surgery! Today, limb amputation causes little comment among small animal clinicians, although some owners may refuse to have such an operation on their animal for a variety of reasons. Probably the majority of amputations are carried out on pet animals, but there are many cases of working dogs, such as sheep dogs, continuing to carry out a useful working life on 3 legs. This removes the first ethical hurdle for the small animal practitioner, as his patient may well be able to carry on a relatively unchanged life, albeit with some of the debilitating diseases of old age expected to develop early. The smaller companion animal amputation is seldom accompanied by the fitting of a prosthesis, since this is generally unnecessary. Complications of cost and difficulties of fitting therefore do not enter into the calculations of the small animal clinician.

For the above reasons, there seems to be little disquiet about limb amputation in man or the smaller companion animals. The techniques are relatively easy to carry out, and the results are generally equitable with a relatively unchanged lifestyle. Suggest amputation of a distal limb in a horse, and all manner of angry comment may be unleashed. However, reasoned consideration of these comments generally shows them to be emotional and sophistical responses.

The first consideration when discussing amputation is purely that of carrying out an amputation and 'disfiguring' an animal. Cows' cleys have long been amputated to save them from discomfort, and laws had to be passed to stop amputation of the horse's tail, so this is hardly a justifiable or reasoned consideration. There are also records of cows being fitted with prosthetic limbs in the 19th century, although the detail of procedure and outcome is sketchy!

The fact that there will be some change in the lifestyle of the horse is of course incontestable. It will no longer be able to canter around a field, or jump fences without injury. It **should, however, be capable of some controlled exercise if the procedures progress satisfactorily.**

Many veterinary surgeons explaining to an owner that a horse can no longer be worked have been faced with the response, "he will have to be destroyed, he would never be happy retired." Is this true? Is it anthropomorphism, or an

owner not wanting to admit that they do not want the bother (or cost) of a retired horse? My 26-year-old gelding, once an avid showjumper, continues to enjoy gentle competitive riding (judging by his demeanour and winnings), but seems equally content in the field. His 25-year-old companion, once frantic if she were left behind, now seems to prefer a life of retirement and, indeed, refuses to do more than a gentle hack or walk around the village. Horses, like people, change with time and will usually adjust to their circumstances; of course, some may do themselves irreparable harm while adjusting, in which case one should not consider amputation for that individual.

Certainly, **temperament must be taken into consideration** when contemplating any major surgical procedure. The restricted future mobility of the horse alone, however, should not lead us to discount amputation in all horses. There are now many recorded cases of equine amputees continuing to have useful lives as brood mares and stallions. If an owner wishes to keep a horse as a companion animal, rather than for the more conventional reason of riding, driving or breeding, why should they not do so? If that companion's life might be saved by amputation and fitting of a prosthesis, why should that horse not receive the same consideration as a dog or cat, provided of course that it has a satisfactory standard of life?

The standard of life that can be expected is perhaps the major consideration in these cases. All veterinary surgeons in the UK have taken an oath which, among other things, states: "my constant endeavour will be to ensure the welfare of the animals committed to my care"; in the USA, the oath includes "the protection of animal health, the relief of animal suffering". If as a result of amputation an animal was in constant pain, or suffering, then this would not be consistent with the oath, and would make the procedure unjustified. The recorded cases in the literature, and cases of which this writer knows, indicate that at least some of these cases are pain-free, and live quite satisfactory lives. A number, however, may be in constant pain and these later cases should perhaps be destroyed on humane grounds. This raises the insoluble question as to how long one should persevere with a case that is in pain, but may get better. There is no simple answer to this, except that every case must be judged on its individual merits. The long-term success for these cases is currently quite limited. The techniques of surgery still need to be refined and, most importantly, the fitting of a prosthesis and the type of prosthesis used is still a matter for experimentation. This, however, is surely no reason to abandon the technique?

Early attempts at internal fixation of fractures in horses were frankly heroic and usually doomed to failure, but techniques improved, much has been learned, and many horses can now be saved and lead productive and useful lives after fracture repair. We are witnessing the early attempts at fitting limb prosthetics in the horse. **It is important that experience is published**, and that future cases can benefit from this experience. It is also essential that we make progress carefully, and build on what has gone before. Too often in our profession we are tempted to try a technique we have read about, but of which we have no experience, and repeat the errors others have already made before us.

Kelmer *et al.* (2004) emphasise the need to assess each case with care. This cannot be overemphasised. Not only must the clinical condition be considered, but the horse's temperament is also essential both to the success of the treatment and to how the horse will adjust to its altered circumstances in the long term. In this paper, these points have been discussed, but there must be some concern about the condition of the horse prior to surgery. Every clinician knows that every case is different and must be judged on its own merits. The presence of such a large mass on the limb prior to amputation in this case inevitably makes one question the care given to the horse prior to surgery. Perhaps surgical options should have been considered sooner? One must also question whether the technique of amputation was appropriate in a case with such long-term and well-established infection. We cannot fully judge the merits of any case we have not assessed ourselves. Suffice to say that sufficient reports of amputation now exist for us to be sure that the technique will continue to be employed. It is incumbent upon us to ensure that we control its use, and develop the techniques to benefit the patients, not to placate their owners or to boost a surgeon's ego.

Reference

Kelmer, G., Steinman, A., Levi, O. and Johnston, D.E. (2004) Amputation and prosthesis in a horse: short- and long-term complications. *Equine vet. Educ.* **16**, 235-240.