CPD article

Crate confinement of dogs following orthopaedic surgery. Part 1: benefits and possible drawbacks

Following orthopaedic surgery, crate restriction helps to control patient activity, hence reducing risk of damage to healing tissues and to surgical implants. Running, jumping, use of stairs and slick flooring must generally be avoided until late in recovery. It is postulated that rates of surgical complications may be reduced if post-operative activity restriction is optimised. Musculoskeletal structures tend to become stronger with increased loading, and weaker with reduced loading; crate confinement should therefore only be prescribed in conjunction with a graduated exercise programme. Prescription of crate confinement is not a trivial decision for patient or owner. Unaccustomed confinement has potential welfare implications. The behavioural response of a dog to 'crate rest' depends on genetic factors, previous training and experience, and management factors. Clinicians must be aware that confinement may be distressing for some dogs, and be prepared to offer advice on improving patient comfort during recovery.

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Following orthopaedic surgery, owners are routinely advised to confine their dog to prevent over-activity. Depending on patient size and behaviour, restriction to a crate (*Figure 1*), indoor dog pen or suitable room may be advised.

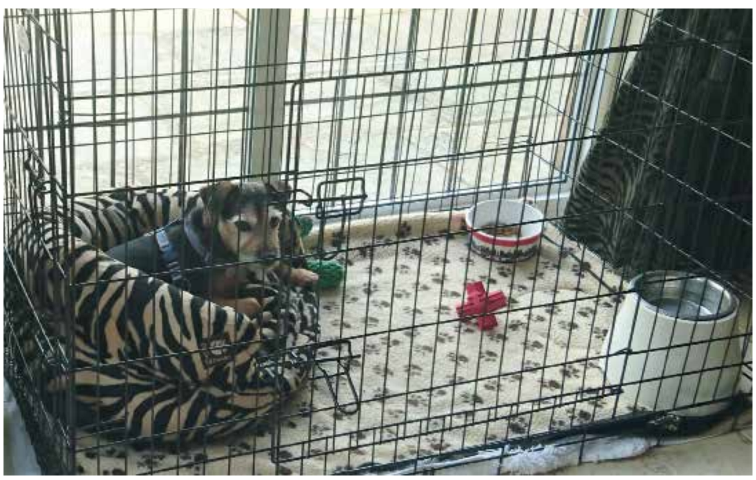

Figure 1. Terrier crossbreed in an appropriately-sized recovery crate.

This article discusses possible pros and cons of post-operative confinement. A second article will suggest practical ways to optimise the set-up of the crate, pen or recovery room.

There are as yet no accepted guidelines regarding size or layout of canine recovery crates, and very little has yet been written about either post-operative activity restriction or recovery crates in the veterinary literature. However, this topic deserves careful attention. Optimising home care during the recovery period will benefit patient comfort and welfare, and may be key to reducing post-operative complication rates.

Used properly, post-operative crates are a useful tool for controlling indoor activity, hence reducing risk of damage both to healing tissues and to surgical implants. However, crate-restriction has the potential to cause significant distress to the patient if introduced or set up incorrectly. Furthermore, enforcing inactivity too strictly may have deleterious effects both on healing structures and on previously healthy tissues.

Why confine dogs postoperatively?

Risk of mechanical damage

Recovering dogs typically attempt to continue with familiar activities in the home environment, before tissues are strong enough to withstand the high forces involved. Therefore, to prevent patients from jumping on and off furniture, using stairs, running (*Figure 2*), and turning at high speed, careful restriction is required.

Following surgery or injury, excessive patient activity may cause mechanical damage in the following ways:

- Mechanical overload may cause connective tissues to fail either by tearing of collagen fibrils when their tensile strength is exceeded, or by 'creep', whereby fibrils slide past each other until the tissue disaggregates (Ottani et al, 2001).
- Excess loading and movement of tissue planes relative to one another will contribute to seroma formation (Moores, 2016), especially during the inflammatory phase of healing, which predominates during the first 1–2 weeks following injury or surgery.
- Surgical implants including pins, screws and plates may fail due to excessive mechanical forces (Johnson, 2016). For bone plates, two scenarios must be considered (Goh et al, 2009): (1) plastic deformation or breakage of plates caused by acute overload due to occasional lapse of activity restriction, especially in the early post-operative period; or (2) eventual plate failure due to the excessive cyclic loads of daily walking exercise. The second scenario becomes more likely if healing is delayed (Johnson, 2016).
- Overload caused by daily activities may lead to fractures with or without associated implant failure. For example, a retrospective study looking at outcome following management of cranial cruciate ligament (CrCL) pathology using the tibial tuberosity advancement (TTA) TTA-Rapid technique in 152 stifles (Butterworth and Kydd, 2017) reported causes of three incidences of postoperative tibial fracture. Cases included a Whippet crossbred that jumped off a bed on day 4 post-operatively, a Staffordshire Bull Terrier that chased another dog on or just before day 10, and a Golden Retriever that caught the limb on a step on day 7.

Risk of developing compensatory gait pattern

When pain or weakness is present in one part of the body, dogs tend to develop a compensatory gait pattern or lameness (Rumph et al, 1995; Fischer et al, 2013). With repetition, abnormal gait patterns can become habitual, as has been observed in humans (Christiansen et al, 2013). Furthermore, reduced loading of the affected limb leads to atrophy of ipsilateral muscles, and resulting muscle asymmetry may contribute to long term lameness.

To reduce the likelihood of mechanical overload causing pathology in the contralateral limb, care should be taken to prevent compensatory gait patterns from becoming habitual. In many cases, such patients are capable of walking slowly with minimal lameness but, when unrestrained, choose to move faster with a dramatic lameness. Where a marked compensatory gait pattern is present, it is beneficial for all walking to be slow and on the lead, as far as is possible. Between sessions of lead exercise, crate or small room confinement helps to achieve this.

Mechanical forces acting on healing tissues during daily activities

Mechanical overload is expected to increase risk of damage during recovery, as already outlined. In considering which activities are

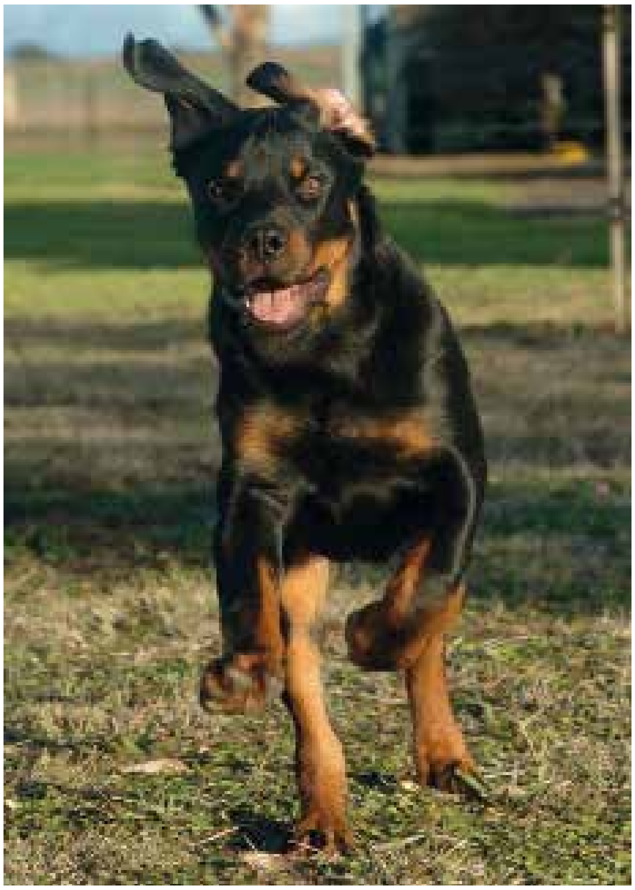

Figure 2. Running must generally be avoided until late in recovery.

to be avoided postoperatively, it may be helpful to estimate the relative magnitude of mechanical forces acting through limbs during the various gaits.

Ground reaction forces (GRFs) are those exerted by the ground on the limb during stance phase; they can be measured by force plate analysis.

Though GRFs do not directly reflect forces acting through joints, tissues and surgical implants, they provide an estimate for the net force acting through a limb.

Ground reaction forces recorded during various gaits (see *Table 1*) show that maximum limb loading is increased by about one third when the dog trots as compared with walking. Galloping increases vertical peak forces by about 3.5 times compared with walking, while jump-landing may increase loading around ten-fold.

In the clinical situation, it must be remembered that tight turns (change of walking direction), sudden acceleration or deceleration, varying ground surfaces, ramps and stairs will further influence limb loading, while interaction with other dogs may make limb-loading unpredictable (*Figure 3*).

Some indications for post-operative confinement

Cage or room rest is routinely prescribed following almost all surgical orthopaedic procedures. Some frequently-encountered situations are included below.

Table 1. Ground reaction forces acting through the limbs during various canine activities

Activity/gait	Type of dog	Approximate peak vertical GRF acting through each limb	Reference
Walking	Large breeds	0.63 x BW (thoracic limbs) 0.39 x BW (pelvic limbs)	Bockstahler et al, 2007
Standing	German Shepherd Dog	0.31 x BW (thoracic limbs) 0.19 X BW (pelvic limbs)	Fischer et al, 2011
Trotting	Large breeds	1 x BW (thoracic limbs) 0.7 x BW (pelvic limbs)	Brady et al, 2013
Rotary gallop	Large breeds	2x BW (thoracic limbs) 1.5 xBW (pelvic limbs)	Walter and Carrier, 2006
Landing from a hurdle jump	Border Collies	3 x BW (pelvic limbs) 4.5 x BW (thoracic limbs)	Pfau et al, 2011
GRF=ground reaction force; BW=body weight			

Figure 3. Interaction between dogs causes increased, unpredictable limb-loading.

Stifle surgery for management of cranial cruciate ligament pathology

For CrCL osteotomies and for the lateral fabellotibial suture (LFTS) technique (Casale and McCarthy, 2009) it is likely that optimising post-operative activity levels will result in reduced incidence of complications. Post-operative complications associated with these procedures are listed in *Table 2*. Over-activity would be expected to increase the risks of tissue inflammation, seroma formation, and some types of post-operative fracture and implant failure, though there are as yet no studies investigating this. Poor management of the exercise-restricted dog may predispose to self-trauma secondary to discomfort and boredom, possibly contributing to incisional infection and inflammation and bandage-related complications.

During recovery from CrCL injury, tibiofemoral shear forces, stifle joint contact forces, and forces across osteotomy sites are likely to be more relevant to recovery than peak GFR. However, the in vivo loading environment both within a canine joint and across an osteotomy site is difficult to estimate because of complex structural anatomy, variation in muscle activity, and individual gait variation.

Allowing quiet standing and a brief period of slow lead-walking on the operated limb is appropriate from day one post-operatively in most cases. To prevent exuberant activity when the dog is off-lead, containment within a crate or small room is generally recommended at least until bony healing is documented for the osteotomies, or until at least 6 weeks post-operatively following LFTS.

Muscle activation plays a key role in recovery from CrCL pathology (Adrian et al, 2013). Crate or room restriction should therefore be recommended for these dogs only in conjunction with a prescribed programme of both progressive strengthening exercises and slow lead-walking.

Surgical correction of medial patellar luxation (MPL)

Following patellar surgery with or without tibial tuberosity transposition-advancement (TTT), good control of postoperative activity is expected to improve outcome. Exuberant jumping onto the sofa or during play, leaping forward from rest (e.g. in response to the doorbell), or rapid stair ascent will put high forces through the quadriceps-patellar mechanism. It is postulated that these activities may contribute to the development of postoperative patellar tendonitis and to failure or displacement of the TTT implant.

A controlled programme of static loading and increased walk duration following patellar surgery will progressively load the quadriceps-patellar mechanism and is expected to benefit recovery.

Tendon repair

Suture-repaired tendons are extremely friable during the first post-operative week, with the anastomosis being at its weakest around day 3–5 (Mason and Allen, 1941). Some strengthening then occurs as inflammation wanes and the proliferative stage of healing predominates. Significant further strengthening occurs during the remodelling phase of healing, which starts at around 4–6 weeks and continues for many months, (Doillon et al, 1985; Woo et al, 1999). Ability of tendons to withstand high forces depends on the relative proportion of different types and sizes of collagen, alignment of collagen fibrils, and cross-linkage between them (Ottani et al, 2001), factors which are optimised during the remodelling phase (James et al, 2008).

To minimise risk of rupture, repaired tendons are immobilised for 3–6 weeks. Options include a splint, cast, transarticular external fixator or, for some cases of Achilles repair, calcaneotibial screw. Containment within a room, crate or pen is required during this period to prevent damage to, or displacement of, the means of support. Failure of the immobilisation technique is likely to result in tendon repair rupture or gap formation (Zhao et al, 2007).

It is prudent to increase tissue-loading gradually and with great care after removal of the support, because further remodelling and strengthening has yet to occur and tendon is still relatively weak at this stage. Mason and Allen (1941) tested post-mortem tensile strength of sutured canine flexor carpi ulnaris tendon at up to 5 weeks postoperatively. At 35 days, for dogs in which a cast had been maintained in place, sutured tendons supported approximately 50 times less force per square millimetre than intact tendons before rupturing.

Running and jumping should only be introduced after a graduated increase in static weight-bearing, walking and trotting.

Table 2. Reported complications of CrCL surgery and patellar surgery

Surgical procedure	Reported post-operative complications. Percentage incidence rates are shown in brackets	References, types of study, and number of stifles (n)
Tibial tuberosity advancement (TTA)	Incisional infection and inflammation (6.6%) Tibial fractures (4.0%) Late meniscal injury (3.6%) Implant failures (including breakage of body of the fork, failure of cage implant, breakage of cage flanges, screw loosening) (2.0%) Incisional seroma (0.6%) Severe patellar tendonitis (0.4%)	Wolf et al (2012) Retrospective single-centre study n= 501
TTA-Rapid	Late meniscal injury (5.9%) Tibial tuberosity fracture as incidental finding on follow-up radiography (5.2%) Surgical site infections (2.0%) Tibial fracture secondary to known minor trauma (2.0%) Minor implant damage, not clinically significant (0.7%)	Butterworth and Kydd (2017) Retrospective two-centre study n=152
Tibial plateau levelling osteotomy (TPLO)	Infection (2.8%) Incisional oedema, haematoma or bruising (2.1%) Tibial tuberosity fracture (2.0%) Patellar tendinitis (1.5%) Late meniscal tear (1.4%) Implant failure (broken or loosened screws, loosened Kirschner wires, or other) (0.95%) Wound dehiscence (0.74%) Osteomyelitis (0.74%) Seroma (0.7%) Pivot shift (0.56%) Fibular fracture (0.47%) Internal tibial torsion (0.36%) Delayed union (0.27%) Medial patellar luxation (0.24%) Patellar fracture (0.12%) Tibial fracture (0.12%)	Mean averages of results from ten studies included in a review of TPLO papers (Bergh and Peirone 2012) Total n=3370
Lateral tibiofabella suture	Late meniscal tear (7.1%) Infection of surgical site (3.9%) Self-trauma (3.6%) Swelling and discharge (3.3%) Bandage-related complications (2.8%) Inflammation associated with the suture implant (2.8%)	Casale and McCarthy (2009) Retrospective single-centre study n =363
Surgical correction of medial patellar luxation (MPL)	Patellar reluxation requiring further surgery (6.9%) TTT implant failure (0.8%) TTT implant loosening (1.5%) Tibial tuberosity fracture avulsion (1.5%) Fracture of proximal tibia and fibula (0.8%) Septic arthritis (0.8%) Failure to correct grade 4 MPL (0.8%)	Arthurs and Langley-Hobbs (2006) Retrospective two-centre study looking at surgical MPL procedures. n=131
	Soft tissue irritation including patellar tendonitis (18.2%) Recurrence of luxation (12.4%) Implant migration (11.6%) Implant failure (i.e. breakage, with or without displacement of osteotomy segment) (6.6%) Infection (1.5%)	Stanke et al (2014) n=137 Retrospective study of tibial tuberosity transposition (TTT) procedures.

During this late period of exercise build-up, a crate, small room or pen continue to be a useful part of the strategy to prevent limb overloading, especially for excitable animals.

Ligament repair

Loading must be similarly restricted during recovery from ligament repair. Tensile strength of sutured ligament is altered by inflammation and subsequent proliferation and remodelling of this collagen-rich tissue. Suture-repaired ligament is weak at 3 weeks post-operatively, has more than doubled in strength at 6 weeks, and continues to strengthen over further weeks. (Tipton et al, 1970).

Fracture repair

Following fracture repair, the mechanical environment of the fracture callus is highly complex, being affected by many factors including stability of fixation, type of loading, patient weight and conformation and the geometry of the fracture (Morgan et al, 2008). Specific aftercare requirements vary depending on patient conformation, age and behaviour, and on the type of fracture and repair.

Possible drawbacks of crate confinement

Emotional effects of unaccustomed confinement

We should aim to optimise welfare in caged dogs by ensuring that their nutritional, environmental, health, behavioural and mental needs are met (Hawkins et al, 2011). Enforced cage-restriction has the potential to cause a significant welfare shortfall in some situations, most obviously in animals that are left unaccompanied in a cage while the owner is out at work.

A small controlled study on Beagles (Beerda et al, 1999), suggests that 6-weeks of social and spatial restriction results in behavioural signs of stress, and may adversely affect longer-term behaviour. Dogs confined alone in small indoor kennels showed increased self-grooming, paw-lifting, vocalising and repetitive behaviour. When subsequently challenged with novel situations, the confined dogs showed increased excitement, uncertainty and aggression than control dogs.

The ease with which canine patients cope with crate restriction is likely to depend on genetic factors, previous training and experience, and management factors. Method of introduction to the crate; size and comfort of crate; sources of sensory stimulation while in the crate; type, quantity, and regularity of human interaction; and frequency of 'toilet breaks' or exercise sessions outside the crate are all likely to affect the patient's acceptance of the new routine.

Potential causes of emotional stress in crate-restricted dogs include:

- Reduced social interaction, e.g. inability to interact with other dogs in the house (*Figure 4*), inability to greet owners at the door
- Lack of control (Wiepkema and Koolhas, 1993; Taylor and Mills, 2007) e.g. inability to choose when to go outdoors, when to access preferred areas of the house (*Figure 5*), or when to initiate social contact
- Inability either to range within the home and garden area, or to go for usual daily walks, both of which are natural canine behaviours (Hubrecht et al, 2016)
- Until a new regular routine is formed, apparent unpredictability of the situation (Wiepkema and Koolhas, 1993; Taylor and Mills, 2007)
- Lack of visual and olfactory stimulation, e.g. inability to see out of the window or to see and smell family members as they enter and leave the home
- Inability to move away from sources of over-stimulation, particularly if the crate is positioned in a busy area of the home
- Inconsistent handling from the owner during introduction to the crate, i.e. use of verbal or physical negative reinforcement techniques either alone or in combination with use of rewards: it is all too easy for kind-hearted but frustrated owners to lose their temper and to either shout at the dog or to manhandle them into the crate.

There are as yet no studies investigating the behaviour of dogs confined during recovery from orthopaedic disease, many of whom will be experiencing post-operative pain in addition to spatial restriction. Though currently lacking direct scientific evidence, clinicians should assume that enforced crate rest may be stressful for patients in some situations, and be prepared to suggest ways to improve patient comfort during recovery.

Figure 4. Dogs are social animals, and enforced solitary confinement has potential to cause distress (photo courtesy of Melanie Bruder).

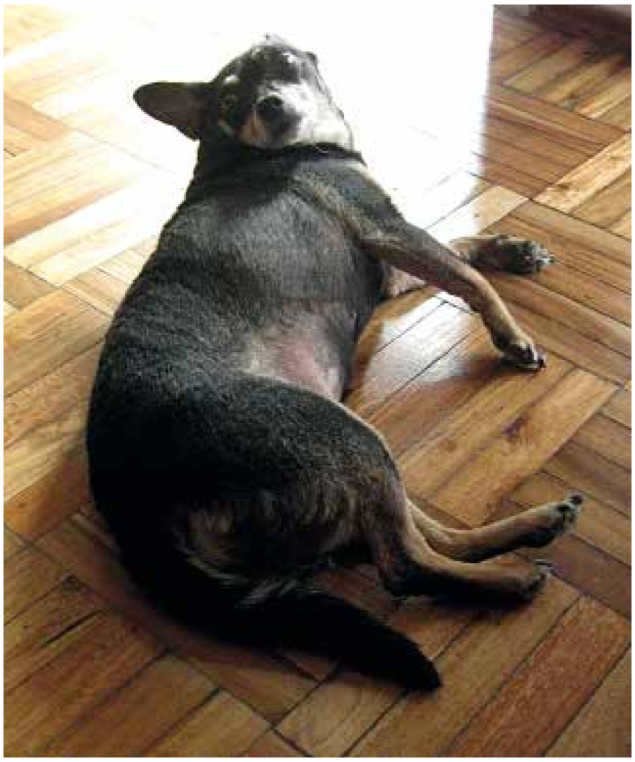

Figure 5. Unconfined dogs have control over where they choose to rest.

Physical effects of cage confinement

During repair and remodelling, tissues adapt and strengthen in response to mechanical applied loads. Musculoskeletal structures therefore tend to become stronger with increased loading, and weaker with reduced loading. This involves the process of mechanotransduction: the physiological mechanism whereby cells convert mechanical stimuli into biochemical responses (Duncan and Turner, 1995; Morgan et al, 2008; Khan and Scott, 2009). Tissues require incremental loading in order to reach optimal strength following injury or repair. Weeks of cage-confinement followed by immediate resumption of jumping and running may therefore cause re-injury.

Experimental studies have investigated the weakening of bone, ligament, tendon, muscle and articular cartilage that occurs as a result of non-weight-bearing, with or without limb immobilisation (see *Table 3*). However, physical effects of canine cage rest have not yet been thoroughly investigated. As tissues adapt by strengthening in response to applied loads, several weeks of enforced cage rest may be expected to lead to weakening of musculoskeletal tissues.

In dogs, the above hypothesis appears to be supported by a study looking at tissue strength following 6 weeks of confinement within different sizes of enclosure (Laros et al, 1971). Unfortunately, study design does not appear to have included randomisation or blinding. Dogs <19 kg body weight were divided into two groups: 24 dogs housed singly in cages of 78 cm x 78 cm x 78 cm, and 21 dogs housed singly in indoor-outdoor pens of 6.1 m x 1.5 m. Breaking strength of medial and lateral collateral stifle ligaments was measured after 6 weeks. Ratio of ligament breaking strength to body weight was reduced in cage-confined dogs as compared with those given access to larger pens. Histological changes were also noted. The authors concluded that simple caging for

Table 3. Documented effects of limb disuse

Tissue	Species	Time period	Significant changes	Immobilisation or non-weight bearing	Reference
Muscle	Dogs	6 weeks	Reduced muscle mass	Cast immobilisation	Tipton et al, 1970
	Human	4 weeks	Reduced peak torque, angle-specific torque and muscle cross-sectional area (CSA)	Lower limb suspended, walking on crutches	Berg et al, 1991
	Rats	3 weeks	Reduced muscle mass	Pelvic limb suspended	Provenzano et al, 2003
	Rats	14 days	Reduced type I fiber diameter, absolute force, normalised force, and stiffness of muscle fibres	Pelvic limb suspended	Widrick and Fitts, 1997
	Rats	<2 weeks	Reduced muscle size	Cast immobilisation	Mattsson, 1972
	Cats	22 weeks	Reduced muscle weight, histological changes	Cast immobilisation	Cooper, 1972
Bone	Dogs	2–4 weeks	Reduced bone mass (disuse osteoporosis)	Cast immobilisation	Burkhart and Jowsey, 1967; Semb, 1969; Uhthuff and Jaworski, 1978
	Rats	4 weeks	Radiographic appearance of osteoporosis	Cast immobilisation	Mattsson, 1972
	Dogs	8 weeks	Reduced bone mass	Amputation of distal limb	Klein et al, 1989
	Rats	3 weeks	Reduced bone density and bone strength	Pelvic limb suspended	Provenzano et al, 2003
Ligament	Rats	Full paper unavailable	Reduced stiffness, linear stress and maximum stress of medial collateral ligaments	Stifle joint immobilisation	Binckley and Peat, 1986
	Rabbits	Full paper unavailable	Reduced ligament stiffness, ultimate load, and energy-absorbing capabilities of bone-ligament complex. On testing, an increased number of failures occurred by tibial avulsion. Histological changes	Stifle joint immobilisation	Woo et al, 1987
Suture-repaired ligament	Dogs	6 weeks	Reduced breaking strength of suture-repaired medial collateral ligament	Cast immobilisation	Tipton et al, 1970
	Rats	3–8 weeks	Reduced healing of suture-repaired stifle collateral ligaments	Limb suspended in tail sling	Provenzano et al, 2003
Suture-repaired tendon	Dogs	16–35 days	Reduced tensile strength of repaired tendon	Cast immobilisation	Mason and Allen, 1941
Cartilage	Dogs	3 weeks	Impaired proteoglycan aggregation, i.e. defective macromolecular organisation of cartilage	Cast immobilisation. Tiny study	Palmoski et al, 1979
	Dogs	6 weeks	Reduced stifle cartilage thickness, water content and proteoglycan aggregation	Non-weight-bearing following amputation just proximal to hock joint. Tiny study	Palmoski et al, 1980
	Dogs	11 weeks	Reduced cartilage thickness; softening of femoral and tibial cartilages	Splint immobilisation	Jurvelin et al, 1986

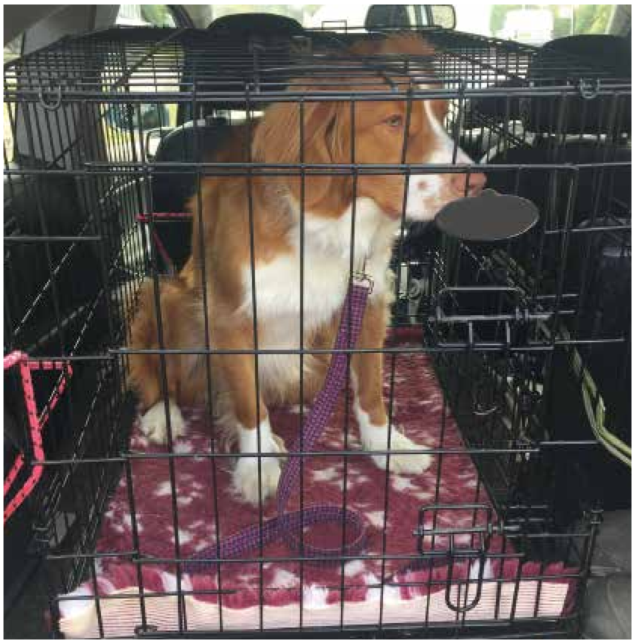

Figure 6. Dog in a crate. This set-up is appropriate for short journeys, but would be too cramped for this size of dog as a recovery crate. (Courtesy of Jennifer Alcock)

6 weeks or more, without limb immobilisation, weakened distal attachments of stifle medial and lateral collateral ligaments by causing subperiosteal bone resorption.

If several weeks of cage-rest does indeed cause weakening of previously-healthy tissues, this may increase the chance of subsequent injury to the unaffected limb on resumption of full exercise. Risk of such contralateral injury would be increased by any lameness ongoing from the previous injury, because offloading of the previously-affected limb would cause increased weight-bearing on the contralateral limb.

Factors relating to the owner

Prescribed avoidance of canine activities is not a trivial matter for pet-owners. Practical, physical and emotional issues include the following:

- Not all owners are available to supervise or interact with their confined dog; unless they make other arrangements, owners who go out to work each day may end up leaving their confined pet unattended for hours at a time
- Some owners find it emotionally stressful to confine their dog to a cage or small room, especially if their pet cries, barks frequently or appears otherwise distressed
- For those owners who are accustomed to letting their dog out unsupervised into the garden for toileting, the requirement to keep their dog on a short lead whenever outdoors demands extra time-commitment
- Some owners find it particularly difficult to ban their dogs from jumping on and off furniture, especially if their pet has been accustomed to relaxing on the sofa or bed
- Few homes have step-free garden access, and dogs therefore need to be lifted outdoors for toileting if they are to avoid use of stairs. However, not all dog owners are capable of lifting their animal.
- Some owners find it physically difficult or impossible to bend over and restrain their pet safely as it leaves a crate.

Clinicians should be aware of the difficulties that owners face within the home environment post-operatively. In order to improve owner compliance, clinicians need to discuss practical details of crate-restriction in advance of elective surgery, and be prepared to offer alternative strategies if required.

Areas requiring further investigation

Further studies are required to help optimise guidelines for post-operative patient confinement. Areas worthy of further investigation include:

- Activity levels of unattended dogs confined to small or large enclosures during recovery within the home environment
- Possible factors affecting markers of stress in home crate-confined dogs during post-operative recovery (e.g. size of crate, presence of toys, position of crate)
- Owner compliance with post-operative protocols that include the use of crate, pen or small room confinement
- Whether or not there is any correlation between post-operative outcome and the use of crates, pens or small recovery rooms.

Conclusions

Vigorous activities such as running and jumping must generally be postponed until at least 6–8 weeks following orthopaedic surgery. Within the home, a recovery room, indoor pen or crate continues to be the most practical way to prevent exuberant activity in recovering dogs, hence protecting tissues and implants from post-operative overloading.

Following most types of orthopaedic surgery, it is beneficial for tissue loading to increase gradually over weeks to months once the inflammatory phase of healing subsides (starting from around 7–14 days). While crate or room restriction are appropriate as part of the home care plan, confinement should therefore always be recommended in conjunction with an incrementally-increasing programme of exercise. Decisions on strictness and duration of cage confinement need to be made on a case-by-case basis, considering the strength of the healing tissues and the expected behaviour of the patient.

The patient's recovery area must be set up carefully in order to minimise patient anxiety and optimise patient comfort and safety. In some situations, especially if the patient is left unattended for long periods, postoperative confinement will cause significant welfare problems. Owners need timely and clear advice on how best to confine their dog. Guidelines for optimal size, contents and positioning of the recovery crate will be outlined in Part 2. CA

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KEY POINTS

- Following orthopaedic surgery, exuberant patient activity risks damage to healing tissues and to surgical implants.
- Methods of confining dogs post-operatively include use of a recovery crate, indoor pen or recovery room.
- Musculoskeletal structures tend to become stronger with increased loading, and weaker with reduced loading.
- Crate, pen, or room restriction should be prescribed in conjunction with a graduated exercise programme.
- Decisions on strictness and duration of confinement need to be made on a case-by-case basis.
- Confinement to a crate, pen or small room is likely to cause welfare problems for dogs in some situations.
- Practicalities of crate restriction should be discussed with the owner prior to elective surgery.