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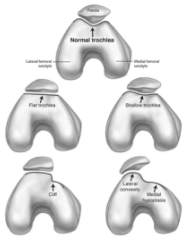
Conservative Management of Medial Patellar Luxations

Patellar Luxation – a little bit of human

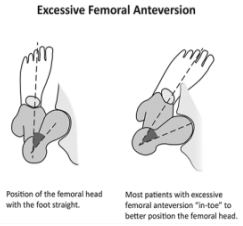
1 • Humans tend to luxate laterally… and here's some reasons why…
- Trochlear dysplasia: low femoral condyle + decreased trochlear depth
- Patellar tilt: due to the shape of the patella and tightness of adjacent soft tissues
- Patellar position: i.e. patella alta + increase length of the patellar tendon



Tscholl et al, 2013; McConnell 2007

Patellar Luxation – a little bit of human

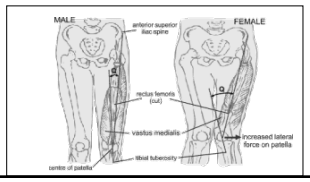
2 • More reasons why…
- Femoral anteversion: funky angle of the femoral head & neck = toeing in & an increased Q-angle (wide hips & narrow knees)
- Non-contractile soft tissue support of hip or knee (anterior hip tightness can contribute to hip internal rotation, and medial & lateral retinaculum laxity or tension)
- Lateralized tibial tuberosity



Tscholl et al, 2013; McConnell 2007

Patellar Luxation – a little bit of human

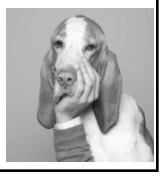
[3] • And a few more…
- Poor pelvic musculature: increasing valgus vector forces (dynamic Q-angle)
- Poor knee muscles: (i.e. vastus medialis inability to counteract vastus lateralis)
- Poor distal muscles: Lower limb and foot control



Tscholl et al, 2013; McConnell 2007

Patellar Luxation – a little bit of human

- Why do you care?
  - Because in order to treat, you must take into account a multitude of factors.
  - Some things may be fixable…
  - Whereas others might do better with surgery…
  - And surgical complications might be in part due to lack of therapies that address 'treatable' soft tissue components!



Patellar Luxation – a little bit of human

- What components can physiotherapy / rehab 'fix'?
  - Strength issues – Quads, Glutes, Hip External Rotators, Abdominals, and Foot & Lower leg
  - Stretching soft tissue structures - muscles, fascia, retinaculum
  - Muscle timing issues – Quads & Glutes
  - Pain – to reduce muscle inhibition

Barton et al 2013; Smith et al 2013

Patellar Luxation – a little bit of human

- What 'TOOLS' can physiotherapy employ?
  - Exercises (targeted and specific for hip and knee)
  - Taping (helps with pain and muscle timing)
  - Electrotherapy (in conjunction with exercise)
  - Bracing / Bracing splinting (mixed reviews actually!)
  - Foot orthoses (their role is unproven)
  - Acupuncture

Lankhorst et al 2013; Smith et al 2013






Patellar Luxation – a little bit of human

- An interesting human study!
  - Patellofemoral pain (PFP) is the most common injury in running and jumping athletes.
  - Incorporating hip and core strengthening (HIP) with knee-focused rehabilitation (KNEE) improves PFP outcomes.
  - Both the HIP and KNEE rehabilitation protocols produced improvements in PFP, function, and strength over 6 weeks.
  - Outcomes were similar, the HIP protocol resulted in earlier resolution of pain and greater overall gains in strength compared with the KNEE protocol.

Ferber et al 2015

Patellar Luxation – a little bit of human

- An interesting human review!
  - Reviewed the effects (benefits and harms) of exercise therapy aimed at reducing knee pain and improving knee function for people with patellofemoral pain syndrome.
  - Exercise therapy for PFPS may result in clinically important reduction in pain and improvement in functional ability, as well as enhancing long-term recovery.
  - There is insufficient evidence to determine the best form of exercise therapy and it is unknown whether this result would apply to all people with PFPS.
  - Hip plus knee exercises may be more effective in reducing pain than knee exercise alone

Van der Heijden et al 2015

Patellar Luxation – a little bit of human

- *Conservative management if the first treatment choice for patellar dislocations in people.*
- *Perhaps there is a subset of dogs that could benefit from conservative management as well.*

So… Let's talk about Canine Patellar Luxation

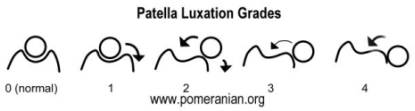


Table 1

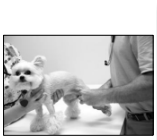
Grades of Severity of Canine Patellar Luxation

Grade I	Patella luxates with manual pressure, and luxation spontaneously resolves with release of the pressure.
Grade II	Patellar luxation occurs frequently during stifle flexion or with manual pressure. The patella remains luxated but reduces with manual pressure.
Grade III	The patella is permanently luxated, but temporary manual reduction is still possible.
Grade IV	The patella is permanently luxated and cannot be manually reduced.

Bevan & Taylor 2004

So… Let's talk about Canine Patellar Luxation

- Tips for doing a better exam
  - Testing in standing
    - Hip extended with knee straight
    - (Puts tension on Sartorius)
    - TEST medially
  - Test in standing
    - Unload the leg
    - Straighten the stifle (with hip flexed slightly)
    - TEST medially & laterally
  - Test in side lying – as shown
    - TEST medially & laterally



Di Dona et al 2018

Patellar Luxation- DOGS

- INCIDENCE OF PATELLAR LUXATION
  - A study in England revealed an overall prevalence of 1.3% in dogs
    - 27.8% bilateral & 62.2% unilateral
    - Of the unilateral cases: 33.9% left side & 38.3% right stifle
    - 54.8% female
    - 88% neutered
    - Higher predisposition in dogs weighing less than the breed average
    - Dogs most affected Pomeranian, Yorkshire Terrier, Chihuahua, French Bulldog, Lhasa Apso, Cavalier King Charles Spaniel, Bichon, Pug, Bulldog, West Highland White Terrier, Jack Russell Terrier, Shih-tzu, Crossbreed, & Staffordshire Bull Terrier
    - 39% received medical management, 13.2% received surgery, 3.7% referred for other…
    - Median age for surgery was 2.9 years

O'Neill et al 2016

Patellar Luxation- DOGS

- INCIDENCE OF PATELLAR LUXATION
  - Equal in heritability between purebred & mixed breed dogs
  - A study on Flat Coated Retrievers
    - Breeding 1-patellar luxation parent increases the prevalence of PL in offspring by 45%
    - Screening for PL reduced the incidence to 28 - 18%.
    - Environmental factors also play a large role in manifestation
  - Screening may be able to reduce the incidence of heritable PL
    - Chihuahua's in Sweden)

Bellumori et al 2013; Heuven et al 2013; Nilsson et al 2018

Patellar Luxation- DOGS

- INCIDENCE OF PATELLAR LUXATION
  - Importance of distinguishing between normal & loose patellae
    - Studying Flat-coated retrievers and Kooiker dogs (n=4602)
    - Loose patellae indicate that dogs are genetically more susceptible to develop PL
    - Family members of dogs with loose patellae showed more severe PL
    - Conclusion: Classify loose patellae… for dog breeders to minimize breeding dogs with a genetically higher susceptibility for PL

Van Grevenhof et al 2016

Patellar Luxation

- INCIDENCE OF PATELLAR LUXATION
  - Females tend to be slightly more affected than males (MPLs)
  - Most luxations are medial (92%) / but flat coat luxations are lateral (62%)
  - MPL has a greater occurance than LPL in both lg. & sm. dogs
  - Labradors may be most affected (in Lg Breeds) – 12%
  - Well known in small dogs (75% of Pomeranians have PL)
  - Small dogs are almost exclusively MPL (vs LPL)
  - LPL occurs more often in lg. dogs

Lavrijsen et al 2013; Bellumori et al 2013; Soontornvipart et al 2013; Bound et al 2009, Alam et al 2007; Gibbons 2006

Patellar Luxation

- INCIDENCE OF PATELLAR LUXATION
  - Lateral Patellar Luxation (n=65)
    - Majority are male
    - Median age of 10 mo
    - Most are large-breed
    - 36% had genu valgum as an issue. (Kalff et al 2014)
  - Lateral Luxations in SMALL dogs (n=9)
    - Mostly female, mostly intact
    - Median age of 18 months
    - Represents 10.2% of dogs diagnosed with patellar luxation
    - LPL may be underestimated in small breed dogs. (Di Dona et al 2016)

Patellar Luxation

- NOVEL CONCEPTS RE: PATELLAR LUXATION
  - PL may be associated with skin hyperextensibility
    - As seen in Ehlers-Danlos Syndrome – a condition that has been reported in dogs.
    - 9 dogs with MPL showed sparse and unevenly distributed collagen fibres that were thin and irregularly shaped within the skin and patellofemoral ligaments – compared to normal dogs

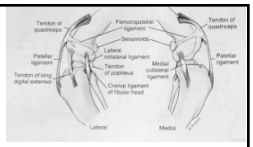


Table 2. Skin extension and skin collagen fibril diameter

No.		Skin extension (%)	n	Diameter of collagen fibrils (nm)	
				Average	SD
1	MPL[a]	15.2	100	75.57	8.30
2	MPL[a]	15.0	100	87.45	14.08
3	MPL[a]	14.7	100	61.92	7.78
4	MPL[a]	15.2	100	85.45	13.40
5	MPL[a]	19.0	100	80.46	9.44
6	MPL[a]	18.5	100	55.45	8.92
7	MPL[a]	21.2	100	52.28	11.57
8	MLPL[b]	19.2	100	73.51	10.13
9	MLPL[b]	30.8	100	*	*
1	Control	12.2	100	96.82	7.81
2	Control	7.8	100	99.13	12.58
3	Control	9.0	100	105.78	16.24
4	Control	8.8	100	114.32	16.23
5	Control	8.3	100	102.29	16.97
Patellar luxation total		18.5	900	71.51**	18.81
Control total		8.8	500	103.67**	15.58

Note: Skin collagen fibril diameter is significantly smaller in dogs with patellar luxation than controls ($P<0.001$). a) MPL=medial patellar luxation; b) MPLP=medial-lateral patellar luxation. *Collagen fibrils with large diameters maintaining a circular shape could not be confirmed. **significant difference ($P<0.001$).

Ueda et al 2018

Patellar Luxation- DOGS

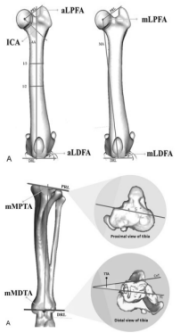
- NOVEL CONCEPTS RE: PATELLAR LUXATION
  - Comparing small breeds and medium-large breeds to look at their Quadriceps angle:
    - Sm Dogs = 18.3˚ (Median)
    - Lg Dogs = 8.7 ˚ (Median)
    - NOTE… these were all Normal dogs.
    - Could explain why small dogs are at greater risk for MPL

Pinna & Romagnoli 2017

Patellar Luxation- DOGS

- NOVEL CONCEPTS RE: PATELLAR LUXATION
- CT imaging – The angles related to MPL in Chihuahuas that should be focused on in diagnosis are the
  - aLDFA
    - anatomical lateral distal femoral angle
  - mLDFA
    - Mechanical lateral distal femoral angle
  - aCdPFA
    - anatomical caudal proximal femoral angle
  - TTA
    - Tibial Torsion Angle

Phetkaew et al 2018



Patellar Luxation

- Patellar Luxation & INCIDENCE OF CCL RUPTURE
  - 41% has been reported - (Campbell et al 2010)
  - Mean age of MPL = 3 years
  - Mean age of MPL + CCL – 7.7 years
  - Grade 4 MPLs were more likely to have associated CCLs
  - One study found complete CCL tears in 44% & incomplete tears in 56% (therefore 100% were affected!) – (Yeadon et al 2011)

Patellar Luxation

- THOUGHTS REGARDING CONCOMITANT CCL RUPTURES:
  - Perhaps if we spent some time strengthening the functioning MPL dogs, we could reduce the incidence of concomitant CCL rupture cases

Patellar Luxation

- COMPLICATIONS
  - 18.5% (Cashmore et al 2014) – most typically implant complications, reluxations, or tibial tubercle avulsions
  - 29% (Gibbons et al 2006) – increased body weight was a factor
  - 43% (Stanke et al 2014) – risks associated with large breeds, increased weight, and use of a screw for the tibial tuberosity fixation.
  - **Factors NOT associated with with complications = increased age and concurrent CCL tear.
  - 11% (in Pomeranians with grade 3 luxations) & 36% in Poms with grade 4 luxations) - (Wangdee et al 2013)
  - Complications may include wound dehiscence, trochlear wedge migration, pin loosening & lymphoplasmacytic synovitis

Patellar Luxation

- THOUGHTS REGARDING COMPLICATIONS:
  - Why not try conservative management (rehab) in all grade 1 & 2 cases?
  - Why not rehab the 'high functioning' grade 3 & 4 cases?
  - Interestingly (to me…) is that release of the cranial belly of sartorius reduced the incidence of patellar relaxation (Cashmore et al 2014).
  - Also interesting is that a medial femoropatellar ligament release can be used solely or in conjunction with tibial tuberal transposition
    - - So perhaps these are an area to focus on when working conservatively?

Patellar Luxation

- GOALS FOR TREATING MPL'S CONSERVATIVELY (in people)
  - Strength & Proprioception
    - Quads in inner range
    - Weight bearing exercises
    - Hip stability & Core stability
    - Gait retraining
  - Manage Pain (pain relieving modalities)
  - Foot management
  - Taping – for improved neuromuscular functioning
  - E-stim to help with muscle recruitment
  - Stretches (iliopsoas / sartorius, hip rotators)
  - Massage / Myofascial release

Patellar Luxation

- IDEAS REGARDING TREATING MPL'S CONSERVATIVELY (in dogs)
  - All Grade 1's & 2's
  - High functioning Grade 3's and 4's
  - Non-surgical candidates
  - Puppies prone to patellar luxation / or those with some laxity
  - And… even if they go for surgery, these concepts can still act as your post operative goals & strategies

Physiotherapy Assessment - Patellar Luxation

- Feel for swelling adjacent to the PATELLA
- Compress the patella (assess for pain)
  - In extension & in flexion

Physiotherapy Assessment –Patellar Luxation

- Assess for gluteal / quads / abdominals strength & motor control & timing
  - Leg-slide test

Physiotherapy Assessment –Patellar Luxation

- Assess for quads control & patellar stability
  - Palpate patellae with sit to stand exercises

Physiotherapy Assessment –Patellar Luxation

- Assess hip ROM – internal & external rotation

Physiotherapy Assessment –Patellar Luxation

- Assess soft tissue length
  - Sartorius
  - Iliopsoas


Physiotherapy Assessment –Patellar Luxation

- Assess for myofascial restrictions
  - Sartorius

Physiotherapy Assessment –Patellar Luxation

- Assess for myofascial restrictions
  - Gluteal Muscles

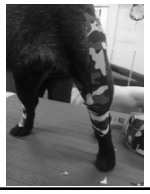
Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – PAIN MANAGEMENT
  - LASER
  - PEMF
  - ACUPUNCTURE
  - ACUTENS (circle the dragon)
  - TENS / E-STIM



Patellar Luxation

- PROTOCOL FOR MPL IN DOGS
  - TAPING – Glutes or Quads
  - ?? HAIR ELASTICS OVER GLUTES / QUADS

Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – STRENGTHENING
  - E-STIM – Glutes or Quads


Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – QUADS STRENGTHENING
  - MINI SQUATS → BIGGER SQUAT

Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – QUADS STRENGTHENING
  - Sit to Stands (but only flexing the stifle by about 20 degrees…)

Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – QUADS STRENGTHENING
  - STEP-UPS (and stimulate the quads) – LOW steps to begin

Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – ABDOM. STRENGTHENING
  - Planking
  - Balancing on an inflatable…


Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – ABDOM. STRENGTHENING
  - Bandaging / Tying the Abdominals
  - Taping the Abdominals…


Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – SOFT TISSUE WORK
  - Stretching Iliopsoas
  - Myofascial release Iliopsoas

Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – SOFT TISSUE WORK
  - Stretch sartorius (hold patella as needed)
  - Massage sartorius

Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – SOFT TISSUE WORK
  - Myofascial release sartorius
  - Myofascial trigger point release sartorius

Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – SOFT TISSUE WORK
  - Massage Gluteals
  - Myofascial release Gluteals

Patellar Luxation

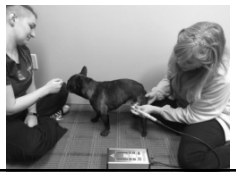
- PROTOCOL FOR MPL IN DOGS – SOFT TISSUE WORK
  - Myofascial techniques for the medial stifle region (fascia, ligaments, tendons)

Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – SOFT TISSUE WORK
  - Myofascial Techniques – Current Patient

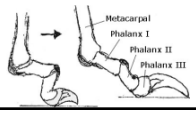
Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – SOFT TISSUE WORK
  - Trigger point release sartorius
    - Shockwave
    - Laser



Patellar Luxation

- PROTOCOL FOR MPL IN DOGS – "FOOT POSITIONING"
  - NAIL Trimming / Hair Trimming
  - Toe grips



45° cut removes tip of nail. Minimise nail impact on the floor.

Grind / Cut slivers off the top of the nail. It helps the quick recede.

Patellar Luxation

- PROTOCOL FOR MPL IN DOGS
  - It might not work for every dog…
  - Choose it for Grades 1 & 2
  - Use it for prevention in puppies of 'at risk' breeds
  - And now you have a plan!!

Thanks for Listening!

www.FourLeg.com

FourLegRehabInc
CANINE REHAB EDUCATIONAL RESOURCES

Conservative Management of Patellar Luxation – REFERENCES

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