

Conservative Management of Soft Tissue Injuries

CONSERVATIVE MANAGEMENT OF SOFT TISSUE INJURIES
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CONSERVATIVE SOFT TISSUE MANAGEMENT

- INTRODUCTION
 - DOG SPORTS ARE BECOMING MORE POPULAR
 - OWNERS ARE LOOKING FOR ANSWERS FOR SPORT-SPECIFIC PERFORMANCE ISSUES
 - IT IS IMPERATIVE THAT THE VETERINARY COMMUNITY BE BETTER PREPARED TO MEET THE NEEDS OF THIS UNIQUE POPULATION.

CONSERVATIVE SOFT TISSUE MANAGEMENT

- DOG SPORTS
 - WHAT DOG SPORTS ARE OUT THERE?

AGILITY	HUNTING	TRACK RACING	LURE COURSING
OBEDIENCE	RALLY-O	FLYBALL	SCENT HURDLE
EARTH DOG	WEIGHT PULLING	FIELD TRIALING	SLED DOG RACING
SKIJORING	FREESTYLE	TRACKING	DISC DOG
DOCK DIVING	HERDING	HUNT TESTS	HUNTING

ETC.

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CONSERVATIVE SOFT TISSUE MANAGEMENT

- UNDER-DIAGNOSED CAUSE OF LAMENESS
- AT RISK:
 - CANINE ATHLETES
 - WORKING DOGS
 - WEEKEND WARRIORS
- ACUTE INJURIES OR CHRONIC DEGENERATIVE ISSUES
- REHAB SKILLS INVALUABLE HERE!



CONSERVATIVE SOFT TISSUE MANAGEMENT

TENDON

- WHAT'S NORMAL FOR **TENDONS**?
 - HEALTHY EXERCISE CAN PROMOTE TENDON (& MUSCLE) REMODELING LEADING TO STRUCTURAL & FUNCTIONAL IMPROVEMENTS.
 - REMODELING INVOLVES BOTH SYNTHESIS AND DEGRADATION OF COLLAGEN WITH A NET DEGRADATION THAT BEGINS IMMEDIATELY AFTER EXERCISE AND THEN SHIFTS TO A NET SYNTHESIS.

Andarawis-Puri et al 2015

CONSERVATIVE SOFT TISSUE MANAGEMENT

TENDON

- THIS CAN GO WRONG!!
 - DEGRADATION CAN BECOME MORE PREVALENT THAN REMODELING...
 - ABSCENCE OF RECOVERY PERIOD (AFTER EXERCISE)
 - OBESITY
 - AGE (OLDER)
 - SEX (FEMALE)
 - (SMOKING & HIGH CHOLESTEROL... IN ANIMALS?)
- = **TENDINOPATHY**

Andarawis-Puri et al 2015

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CONSERVATIVE SOFT TISSUE MANAGEMENT

TENDON


- TENDINOPATHY
 - MUCH OF WHAT IS KNOWN ABOUT TENDINOPATHY IS LATE STAGE...
 - THAT IS WHEN A PATIENT SEEKS HELP!
 - DEVELOPMENT = SOME INFLAMMATION BUT NOT A LARGE INFLAMMATORY CELLULAR RESPONSE
 - INFLAMMATION, WHEN PRESENT, IS A COMPONENT OF A "HEALTHY" BIOLOGICAL RESPONSE THAT USHERS IN A HEALING CASCADE.

Andarawis-Puri et al 2015

CONSERVATIVE SOFT TISSUE MANAGEMENT

TENDON

- INFLAMMATION:
 - "A MULTI-MEDIA PHENOMENON, OF A PATTERN TYPE IN WHICH ALL MEDIATORS WOULD COME AND GO AT THE APPROPRIATE MOMENT...INCREASING VASCULAR PERMEABILITY, ATTRACTING LEUCOCYTES, PRODUCING PAIN, LOCAL EDEMA AND NECROSIS"
 - ROCHA E SILVA 1978
- CLINICAL IMPLICATION:
 - VARIETY OF BIOLOGICAL PROCESSES
 - NOT A SIMPLE ON/OFF PROCESS
 - MORE OF A REPARATIVE MARKER
 - SCOTT ET AL 2004



CONSERVATIVE SOFT TISSUE MANAGEMENT

TENDON

- CHRONIC DEGENERATIVE TENDINOPATHY OR ACUTE TENDON RUPTURE
- DEGENERATIVE TENDINOPATHY OFTEN PRECEDES ACUTE RUPTURES
- TENDINOPATHY IS CONSIDERED A FAILED HEALING RESPONSE THAT IS CHARACTERIZED BY HYPERVASCULARITY, MUCOID DEGENERATION, ECTOPIC BONE AND CARTILAGE NODULES, AND DISORGANIZED EXTRACELLULAR MATRIX

Yang et al 2013

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CONSERVATIVE SOFT TISSUE

MUSCLE STRAINS

• CAUSES FOR MUSCLE INJURIES:

- POOR FLEXIBILITY
- INADEQUATE WARM-UP
- FATIGUE
- SUDDEN FORCEFUL CONTRACTIONS
- OVERREACHING
- STRENGTH IMBALANCES
- INTENSE INTERVAL TRAINING
- INSUFFICIENT BREAKS
- OVERTRAINING




Steiss et al 2002

Steiss 2002; Fitch et al 1997; Neilsen & Pluhar 2005; Sharma & Maffulli 2005; Maganaris et al 2004

CONSERVATIVE SOFT TISSUE MANAGEMENT

MUSCLE STRAINS

- WHAT'S AT RISK?
 - MULTI JOINT MUSCLES
- WHEN?
 - ECCENTRIC MUSCLE CONTRACTIONS
 - OBLIQUE FORCES
 - EXPLOSIVE BURSTS
- WHERE?
 - MUSCULOTENDINOUS JCT & TENO-OSSEOUS JCT
 - MAY OCCUR AT MID BELLY AS WELL



2017/2018

Yang et al 2013; Sharma & Maffulli 2005

CONSERVATIVE SOFT TISSUE MANAGEMENT

- STAGES OF HEALING IN ACUTE INJURY
- TENDON RUPTURE OR MUSCLE STRAIN
 - (1) INFLAMMATION / HEMORRHAGIC PHASE (DAYS 1 – 5)
 - BLOOD CLOT, SWELLING, INFLAMMATORY CELLS
 - (2) PROLIFERATION/REPAIR (DAYS 5 – 21+)
 - RECRUITMENT & PROLIFERATION OF FIBROBLASTS, TENOBLASTS, MYOFIBROBLASTS
 - COLLAGEN IS LAID DOWN & FIBRES BEGIN TO ALIGN
 - (3) REMODELING (1 -2 MONTHS – A YEAR)
 - FIBRE ALIGNMENT CONTINUES & TRANSFORMATION TO SCAR-LIKE TISSUE

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Edge-Hughes 2016; Takagi et al 2011; Kerkhoffs et al 2002

CONSERVATIVE SOFT TISSUE MANAGEMENT

- TREATMENT FOR THE ACUTE INJURY
- **INFLAMMATION PHASE**
 - REST IS BENEFICIAL ONLY IN THE FIRST 24 – 48 HRS. BEYOND THAT IT IS COUNTERPRODUCTIVE TO HEALING
 - PAIN MANAGEMENT
 - TO ICE OR NOT TO ICE?
 - MAY HELP WITH PAIN, MAY HAVE NO VALUE, OR MAY DELAY HEALING
 - MODALITIES
 - ASSIST REMOVAL OF TRAUMATIC EXUDATE

Edge-Hughes 2016; Zhao et al 2002; Sharma & Maffulli 2005

CONSERVATIVE SOFT TISSUE MANAGEMENT

- TREATMENT FOR THE ACUTE INJURY
- **REPAIR PHASE**
 - ASSIST FIBRE ALIGNMENT
 - 1ST TWO WEEKS = 'RELATIVE REST' & PAIN-FREE ROM & STRETCHING
 - AT TWO WEEKS = COLLAGEN SYNTHESIS IS AT IT'S GREATEST
 - ROM & STRETCHING,
 - ACTIVE MUSCLE CONTRACTIONS
 - WALKING, BALANCING, WEIGHT SHIFTING, STEPPING OVER OBSTACLES

Edge-Hughes 2016

CONSERVATIVE SOFT TISSUE MANAGEMENT

- TREATMENT FOR THE ACUTE INJURY
- **REPAIR PHASE**



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Edge-Hughes 2016

CONSERVATIVE SOFT TISSUE MANAGEMENT

- TREATMENT FOR THE ACUTE INJURY
- **REPAIR PHASE**
 - STRENGTHEN – MAY PROMOTE FORMATION OF NEW COLLAGEN OR REVERSE DEGENERATIVE CHANGES
 - ELECTRICAL MUSCLE STIMULATION
 - WALKING, HILLS, OBSTACLES
 - ECCENTRIC EXERCISES

Edge-Hughes 2016

CONSERVATIVE SOFT TISSUE MANAGEMENT

- TREATMENT FOR THE ACUTE INJURY
- **REPAIR PHASE**



Green et al 2003; Khan et al 1999; Lee et al 1997; Sharma & Maffulli 2005; Saini et al 2002

CONSERVATIVE SOFT TISSUE MANAGEMENT


- TREATMENT FOR THE ACUTE INJURY
- **REPAIR PHASE**
 - ENHANCE CIRCULATION
 - MODALITIES
 - ENCOURAGE TISSUE REGENERATION & METABOLISM
 - MODALITIES - LASER, ULTRASOUND AND PEMF ENCOURAGE COLLAGEN SYNTHESIS AND METABOLISM OF TENOCYTES AND MYOCYTES

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Edge-Hughes 2016

CONSERVATIVE SOFT TISSUE MANAGEMENT

- TREATMENT FOR THE ACUTE INJURY
- **REPAIR PHASE**
 - RESTORING COORDINATION & BODY AWARENESS – BALANCE EXERCISES



Edge-Hughes 2016; Sharma & Maffulli 2005

CONSERVATIVE SOFT TISSUE MANAGEMENT

- TREATMENT FOR THE ACUTE INJURY
- **REMODELING PHASE**
 - STRENGTHEN
 - MAINTAIN EXTENSIBILITY
 - ENHANCE JOINT MOBILITY
 - IMPROVEMENT OF THE PROPRIOCEPTION AND NEUROMOTOR CONTROL

Edge-Hughes 2016

CONSERVATIVE SOFT TISSUE MANAGEMENT

- TREATMENT FOR THE ACUTE INJURY
- **REMODELING PHASE**



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Edge-Hughes 2016

CONSERVATIVE SOFT TISSUE MANAGEMENT

- TREATMENT FOR THE ACUTE INJURY
- **REMODELING PHASE**



CONSERVATIVE SOFT TISSUE MANAGEMENT

- SO THIS IS GREAT FOR AN ACUTE MUSCLE STRAIN...
- BUT MOST TENDON LESIONS ARE CHRONIC




CONSERVATIVE SOFT TISSUE MANAGEMENT

- CHRONIC LESIONS = NOT FREQUENTLY INFLAMMATORY
 - REES ET AL 2006
- SYMPTOMS OF PAIN DO NOT COINCIDE WITH ONSET OF PATHOLOGY
 - MAGANARIS ET AL 2004; REES ET AL 2006; WILSON & BEST 2005
- MOST TENDONOPATHIES ARE CHRONIC BY THE TIME THE PATIENT (OR ANIMAL OWNER) SEEKS TREATMENT
 - KHAN ET AL 1999; WILSON & BEST 2005

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CONSERVATIVE SOFT TISSUE MANAGEMENT

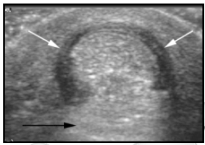
- SO... DO WE STOP THINKING OF TENDON INJURIES AS BEING INFLAMMATORY.
- DO WE STOP SAYING **TENDONITIS?**



Khan et al 1999; Harris & Peduto 2006

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **PARATENONITIS**
 - WHEN A TENDON RUBS OVER A BONY PROTUBERANCE
 - PERITENDINITIS
 - TENOSYNOVITIS
 - TENOVAGINITIS
 - CHARACTERISTICS
 - ACUTE EDEMA & HYPERAEMIA OF PARATENON
 - INFILTRATION OF INFLAMMATORY CELLS
 - FIBROUS EXUDATES FILL THE TENDON SHEATH



Khan et al 1999

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **PARATENONITIS**
 - HISTOLOGICALLY:
 - SCATTERED MILD MONONUCLEAR INFILTRATE
 - +/- FOCAL FIBRIN DEPOSITION & FIBRINOUS EXUDATES
 - MAY BE ASSOCIATED WITH INTRA-TENDINOUS DEGENERATION
 - CONTROVERSY OVER THE OCCURRENCE RATE OF PARATENON INFLAMMATION




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Rees et al 2009; Sharma & Maffulli 2005; Wilson & Best 2005

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS**
 - INTRATENDINOUS DEGENERATION W/O CLINICAL OR HISTOLOGICAL SIGNS OF AN INFLAMMATORY RESPONSE
 - CONSIDERED AN OVERUSE INJURY:
 - EXCESSIVE LOADING OF TENDONS
 - FREQUENT CUMULATIVE MICROTRAUMA
 - SUBSEQUENT MECHANICAL BREAKDOWN



CONSERVATIVE SOFT TISSUE MANAGEMENT

B. Magnus et al. /Foot and Ankle Surgery 20 (2014) 154-159

- **TENDINOSIS**

Intrinsic risk factors

- Age
- Sex
- Body weight
- Tendon Temperature
- Systemic diseases
- Muscle strength, flexibility, previous injuries & anatomical variants
- Genetic Predisposition
- Blood supply

Extrinsic risk factors

- Drugs
- Overuse

↓

Frequent microtrauma

Effects on:

- extracellular matrix
- tenocytes
- tendon stem cells


↓

Subclinical tendinopathy

Sharma & Maffulli 2005; Harris & Peduto 2006; Khan & Scott 2009

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS**
- **HISTOLOGY**
 - COLLAGEN DISORGANIZATION
 - FIBRE SEPARATION
 - INCREASED VASCULARITY
 - HYPERCELLULARITY
 - FOCAL NECROSIS OR CALCIFICATION
 - GRAY-BROWN / PINK-YELLOW APPEARANCE




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Gravare Sibernagel 2001; Sharma & Maffulli 2005; Wilson & Best 2005

CONSERVATIVE SOFT TISSUE MANAGEMENT


- TENDINOSIS
- HISTORY
 - MORNING STIFFNESS & PAIN
 - LESION PAINFUL ON PALPATION
 - REDUCED EXTENSIBILITY
 - MAY ALSO BE CLINICALLY SILENT
 - MAY RUPTURE BEFORE SYMPTOMATIC
 - INSIDIOUS ONSET, ASSOCIATED WITH INCREASED ACTIVITY OR ADDITION OF NEW ACTIVITY



Sharma & Maffulli 2005; Fedorcyk 2006; Rto et al 2014

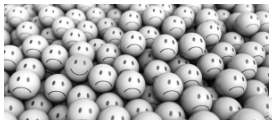
CONSERVATIVE SOFT TISSUE MANAGEMENT

- TENDINOSIS
- PAIN:
 - NOT ALL PAIN IS DUE TO INFLAMMATION!
 - MECHANICAL FACTORS:
 - TENDON DEGENERATION & COLLAGEN BREAKDOWN
 - BIOCHEMICAL FACTORS:
 - GLUTAMATE, SUBSTANCE P, CALCITONIN GENE-RELATED PEPTIDE, LACTATE
 - PERIPHERAL & CENTRAL SENSITIZATION



CONSERVATIVE SOFT TISSUE MANAGEMENT

- TENDINOSIS
 - BY THE TIME THERE IS PAIN... **IT'S LIKELY A TENDINOSIS LESION.**
 - **SO WE CHANGE WHAT WE SAY, HOW WE THINK, AND HOW WE TREAT!**



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Sharma & Maffulli 2006, Kahn et al 1999

CONSERVATIVE SOFT TISSUE MANAGEMENT


- **TENDINOSIS TREATMENT – EXPECTATIONS!!!**
 - TENDONS MUST BE ABLE TO WITHSTAND FORCES UP TO 10 X BODY WEIGHT DURING SPORTS
 - TENDON METABOLISM UTILIZES 13% OF O₂ UPTAKE AS COMPARED TO MUSCLES
 - **THEREFORE TENDON HEALING COULD TAKE MONTHS**

Zitener et al 2010; Andres & Murrell 2008

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT - NSAIDS**
 - NSAIDS ARE NOT RECOMMENDED FOR MUSCLE INJURIES, BONE FRACTURES (ALSO STRESS FRACTURES) OR CHRONIC TENDINOPATHY.
 - HAVE BEEN SHOWN TO INHIBIT OR DELAY COLLAGEN REPAIR OF MUSCLES / TENDONS
 - NSAID TREATMENT SHOULD ALWAYS BE KEPT AS SHORT AS POSSIBLE FOR PAIN MANAGEMENT ONLY

Or... Use a different class of medication for pain management...




Sharma & Maffulli 2005, Norregaard et al 2006

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – REST / IMMOBILIZATION**
 - TENDON ATROPHY
 - REDUCED TENSILE STRENGTH & STRAIN FAILURE
 - DECREASE IN WATER & PROTEOGLYCAN CONTENT
 - INCREASE IN REDUCIBLE COLLAGEN CROSS LINKS

So... What is best?




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Alfredson et al 1998, Ohberg et al 2004, Rees et al 2006

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – LOAD THE TENDON!**
 - STRENGTH TRAINING / MECHANICAL LOADING
 - ACCELERATES TENOCYTE METABOLISM
 - DECREASES TENDON THICKENING
 - RESOLUTION OF NEOVASCULARIZATION
 - INCREASED PATIENT SATISFACTION



Gravare Silbernagel et al 2007

CONSERVATIVE SOFT TISSUE MANAGEMENT

• **TENDINOSIS TREATMENT – LOAD THE TENDON** Achilles Tendon Example

Phase 1: Weeks 1-2

Patient status: Pain and difficulty with all activities, difficulty performing ten 1-legged toe raises

Goal: Start to exercise, gain understanding of their injury and of pain-monitoring model

Treatment program: Perform exercises every day

- Pain-monitoring model information and advice on exercise activity
- Circulation exercises (moving foot up/down)
- 2-legged toe raises standing on the floor (3 sets x 10-15 repetitions/set)
- 1-legged toe raises standing on the floor (3 x 10)
- Sitting toe raises (3 x 10)
- Eccentric toe raises standing on the floor (3 x 10)

Phase 2: Weeks 2-5

Patient status: Pain with exercise, morning stiffness, pain when performing toe raises

Goal: Start strengthening

Treatment program: Perform exercises every day

- 2-legged toe raises standing on edge of stair (3 x 15)
- 1-legged toe raises standing on edge of stair (3 x 15)
- Sitting toe raises (3 x 15)
- Eccentric toe raises standing on edge of stair (3 x 15)
- Quick-rebounding toe raises (3 x 20)

Gravare Silbernagel et al 2007

CONSERVATIVE SOFT TISSUE MANAGEMENT

• **TENDINOSIS TREATMENT - LOAD THE TENDON** Achilles Tendon Example

Phase 3: Weeks 3-12 (longer if needed)

Patient status: Handled the phase 2 exercise program, no pain distally in tendon insertion, possibly decreased or increased morning stiffness

Goal: Heavier strength training, increase or start running and/or jumping activity

Treatment program: Perform exercises every day and with heavier load 2-3 times/week

- 1-legged toe raises standing on edge of stair with added weight (3 x 15)
- Sitting toe raises (3 x 15)
- Eccentric toe raises standing on edge of stair with added weight (3 x 15)
- Quick-rebounding toe raises (3 x 20)
- Plyometric training

Phase 4: Week 12-6 months (longer if needed)

Patient status: Minimal symptoms, morning stiffness not every day, can participate in sports without difficulty

Goal: Maintenance exercise, no symptoms

Treatment program: Perform exercises 2-3 times/week

- 1-legged toe raises standing on edge of stair with added weight (3 x 15)
- Eccentric toe raises standing on edge of stair with added weight (3 x 15)
- Quick-rebounding toe raises (3 x 20)

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Gravare Silbernagel et al 2007

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – REDUCED OR CONTINUED ACTIVITY?**
 - SOME STUDIES ADVOCATE FOR RESTRICTION OF ACTIVITY FOR 8WKS + ECCENTRICS, THEN RESUME LIGHT EXERCISES AFTERWARDS
 - HOWEVER, A PAIN MONITORING SYSTEM SHOWS GOOD RESULTS WITH CONTINUED ACTIVITY THAT INCLUDES RUNNING & JUMPING
 - (IN COMBINATION WITH A TENDON LOADING PROTOCOL)
 - PAIN WITH / AFTER EXERCISE CAN REACH A 5 / 10
 - ANY PAIN SHOULD SUBSIDE BY THE FOLLOWING MORNING
 - PAIN & STIFFNESS SHOULD NOT INCREASE FROM WEEK TO WEEK

Stasinopoulos & Stasinopoulos 2017

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – WHAT KIND OF LOADING IS BEST??**
 - ALFREDSON SAID ECCENTRIC
 - GRAVARE-SILBERNAGEL SAID ECCENTRIC & CONCENTRIC
 - OTHERS ADD IN ISOMETRIC EXERCISES
- ONE STUDY FOUND THAT USING ALL 3 TYPES WAS MOST EFFECTIVE!
- SO... USE SOME OF EACH (WITH A MID SUBSTANCE TENDINOPATHY)!

Chiment et al 2017

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – LOADING AN INSERTIONOPATHY / ENTHESOPATHY**
 - CONCENTRIC EXERCISES
 - ISOMETRIC EXERCISES
 - ECCENTRIC BUT NOT INTO AT FULL STRETCH
 - MIGHT BE AS EFFECTIVE AND HAVE HIGHER PATIENT SATISFACTION

So... How do we load the tendon?

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CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – LOADING TENDONS**
 - STATIC BALANCING PROGRESSIONS – FRONT LEG SOFT TISSUE INJURY



CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – LOADING TENDONS**
 - CONCENTRIC – ECCENTRIC (I.E. ACHILLES TENDON / PATELLAR TENDON)



CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – LOADING TENDONS**
 - CONCENTRIC – ECCENTRIC (I.E. ILIOPSOAS & SUPRASPINATUS / BICEPS)



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CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – LOADING TENDONS**
 - PLYOMETRICS (FRONT LIMB OR REAR LIMB INJURY)



Sharma & Maffulli 2005; Dimitrios et al 2012; Ng & Chung 2012

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – STRETCHING**
 - INCREASES COLLAGEN SYNTHESIS, IMPROVES COLLAGEN FIBRE ALIGNMENT & RESULTS IN HIGHER TENSILE STRENGTH
 - ALLOW STRETCHING TO BE UNPLEASANT BUT NOT PAINFUL
 - STRETCHING + ECCENTRIC TRAINING IS BETTER THAN ECCENTRIC TRAINING ALONE FOR PATELLAR TENDINOPATHY (IMPROVES PAIN & FUNCTION)
 - STRETCHING + LASER MIGHT SLOW TENDINOSIS DEVELOPMENT

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – STRETCHING**
 - PASSIVE OR ACTIVE (I.E. BICEPS & ACHILLES OR PATELLAR TENDON)



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Joseph et al 2012; Howitt et al 2006; Imai et al 2015

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – SOFT TISSUE THERAPIES**
 - **CROSS FIBRE FRICTIONS:** ANECDOTAL EVIDENCE FOR IT'S USE
 - **GRASTON TECHNIQUE:** ANECDOTAL EFFECTIVENESS
 - **ASTYM TECHNIQUE:** IMPROVED TENDON FIBRE ALIGNMENT



Tumilty et al 2010; Stergioulas et al 2008; Haslerud et al 2015; Khan et al 1999

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – LASER THERAPY**
 - INCREASES COLLAGEN PRODUCTION & STIMULATES FIBROBLASTS
 - OPTIMAL LASER CAN OFFER PAIN RELIEF AND A MORE RAPID HEALING
 - EPICONDYLITIS: POSITIVE STUDIES USED WAVELENGTH OF 904NM X 3.5 J/CM2 AND 1064NM X 150 J/CM2
 - ROTATOR CUFF: 4.3 – 42 J/CM2 USING 904 OR 820NM LASERS
 - ACHILLES TENDINOPATHY: 1.8 – 3.6 J/CM2 X 904 OR 820NM LASERS
 - DEQUERVAIN'S: 4 J/CM2 X 830NM LASER.



Bordvick et al 2017; Tumilty et al 2016; Haslerud et al 2017

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – LASER THERAPY**
 - STRETCHING THE ACHILLES CAUSES A HIGHER ENERGY ATTENUATION BY THE TISSUE.
 - ADDING LASER TO AN ECCENTRIC EXERCISE PROGRAM CAN BRING ADDED BENEFITS.
 - CRYOTHERAPY BEFORE LLLT PRODUCES SUPERIOR HISTOLOGY AND BIOMECHANICAL RESULTS.



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Carlisi et al 2018; Malliaropoulos et al 2017; van der Worp et al 20144

CONSERVATIVE SOFT TISSUE MANAGEMENT


- **TENDINOSIS TREATMENT – SHOCKWAVE**
 - FOCUSED-SHOCKWAVE CAN IMPROVE PAIN & FUNCTION IN CALCIFIC TENDINOPATHY LESIONS
 - RADIAL-SHOCKWAVE CAN IMPROVE PAIN IN CALCIFIC TENDINOPATHIES
 - NO DIFFERENCES IN EFFECTIVENESS BETWEEN F-SWT & R-SWT



Carulli et al 2016

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – SHOCKWAVE**
 - MAY BREAK UP CALCIUM DEPOSITS
 - PROMOTES THE RELEASE OF ANGIOGENETIC GROWTH AND PROLIFERATING FACTORS
 - INDUCES NEOVASCULARISATION FOR TISSUE REGENERATION
 - MAY INDUCE AN INFLAMMATORY RESPONSE
 - PAIN RELIEF VIA PERIPHERAL DENERVATION & INHIBITING THE SEROTONERGIC SYSTEM



Lee et al 1997; Stauch et al 2006

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – PULSED ELECTROMAGNETIC FIELD THERAPY**
 - 17HZ IMPROVES COLLAGEN FIBRE ALIGNMENT (AND THE FORCE TO BREAKAGE)
 - IMPROVES TENSILE STRENGTH UP TO 69% 3-WKS AFTER TRANSECTION + SURGICAL REPAIR




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Desmeules et al 2015; Larsson et al 2012

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – THERAPEUTIC ULTRASOUND**
 - ULTRASOUND THERAPY DOES NOT PROVIDE PAIN REDUCTION OR FUNCTIONAL BENEFITS COMPARED TO PLACEBO




X

Rees et al 2006

CONSERVATIVE SOFT TISSUE MANAGEMENT


- **TENDINOSIS TREATMENT – CRYOTHERAPY**
 - USE PRIMARILY FOR ANALGESIC EFFECT
 - MAY HELP WITH PARATENONITIS INFLAMMATION



Kia et al 2018; Fitzpatrick et al 2017; Canapp et al 2016; McDougall et al 2018

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – PLATELET RICH PLASMA**
 - VARIABLE SUCCESS RATES
 - SYSTEMATIC REVIEWS
 - TENDONS TREATED WITH LEUKOCYTE-RICH PRP HAVE GOOD FUNCTIONAL OUTCOMES & REDUCTION OF PAIN
 - META-ANALYSIS
 - CANINE STUDIES HAVE SHOW POSITIVE RESULTS FOR SUPRASPINATUS TENDINOPATHY (FOR REDUCING TENDON SIZE AND IMPROVING FIBRE PATTERN)




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Allahverdi et al 2015; Barbosa et al 2013; de Carvalho et al 2016

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – PLATELET RICH PLASMA**
 - TENDINOPATHY LESIONS: **COMBINING LLLT & PRP** FOR ACHILLES TENDON INJURIES (IN RATS)
 - PRP ALONE OR LLLT ALONE WERE BETTER THAN NOTHING
 - PRP ALONE AND LLLT ALONE + NO SIGNIFICANT DIFFERENCES BETWEEN GROUPS
 - PRP + LLLT = SIGNIFICANTLY DECREASED HEALING TIME COMPARED TO ANY OF THE GROUPS
 - PRP + LLLT = HIGHER DEPOSITION OF COLLAGEN TYPE 1.
 - PRP + LLLT AT 830 NM RESULTED IN A LARGER NUMBER OF FIBROBLASTS AND INCREASED CONCENTRATION OF TYPE 1 COLLAGEN



Pas et al 2017; Romero et al 2017; Oshita et al 2016; McDougall et al 2018; Canapp et al 2016

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – STEM CELL THERAPY**
 - SYSTEMATIC REVIEWS ARE NOW ADVISING AGAINST THE USE OF STEM CELL THERAPY FOR TENDON DISORDERS
 - EQUINE STUDIES ARE FINDING BENEFITS OF STEM CELLS FOR SDFT LESIONS
 - RODENT MODELS SHOW IMPROVEMENT
 - CANINE MODELS SHOW IMPROVEMENT WHEN COMBINED WITH PRP



Sanderson et al 2015; Tsikopoulos et al 2016

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – PROLOTHERAPY OR DRY NEEDLING**
 - PROLOTHERAPY – LIMITED SUPPORT FOR IMPROVING PAIN & FUNCTION
 - DRY NEEDLING – SIMILAR RESULTS TO PRP!

PROLOTHERAPY
The power of SUGAR+INFLAMMATION






Conservative Management of Soft Tissue Injuries

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – NEUROMUSCULAR RETRAINING**
 - REHABILITATION OF COORDINATION, SKILL TRAINING, & GREATER LEVELS OF STRENGTH TRAINING
 - IMPERATIVE FOR CANINE ATHLETES



Edge-Hughes 2016

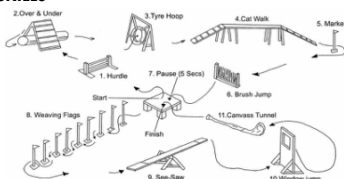
CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – NEUROMUSCULAR RETRAINING**

Exercise Considerations	
Hill-work	Trotting exercises
Acceleration / deceleration activities	Cutting & turning exercises
Jumping exercises	Targeted strengthening
Concentric exercises	Eccentric exercises
Plyometrics	Endurance
Static balance exercises	Dynamic balance exercises

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT - REINTRODUCTION & RETRAINING OF SPORT-SPECIFIC SKILLS**



Conservative Management of Soft Tissue Injuries

Peters et al 2016; Ng & Chung 2012


CONSERVATIVE SOFT TISSUE MANAGEMENT

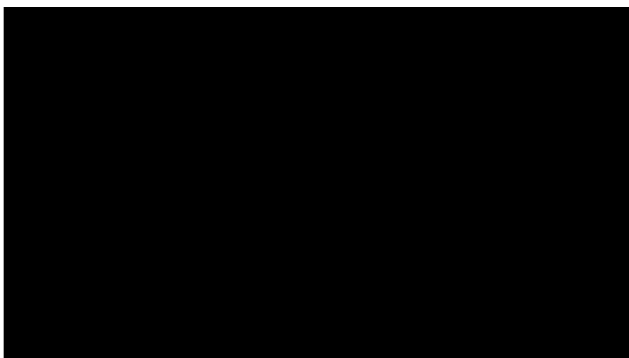
- **TENDINOSIS TREATMENT – CAN WE PREVENT TENDINOPATHY?**
 - LIMITED EVIDENCE THAT BALANCING TRAINING IS PREVENTATIVE
 - SHOCK ABSORBING SHOE INSOLES COULD HELP
 - ?? CANINE TRAINING SURFACES
 - PREVENTATIVE STRETCHING SLOWED TENDINOSIS DEVELOPMENT BUT DID NOT STOP IT
 - PROPHYLACTIC ECCENTRIC TRAINING COULD ACTUALLY INCREASE THE RISK!!

Morgan & Coetzee 2018

CONSERVATIVE SOFT TISSUE MANAGEMENT

- **TENDINOSIS TREATMENT – SCREENING FOR TENDINOPATHY**
 - SCREENING TOOLS HAVE BEEN PROPOSED IN HUMAN HEALTHCARE!
 - THE SAME CAN BE DONE FOR CANINE ATHLETES!





Conservative Management of Soft Tissue Injuries

CONSERVATIVE SOFT TISSUE MANAGEMENT

- TENDONS TO CHECK –
 - SUPRASPINATUS
 - BICEPS BRACHII
 - INFRASPINATUS
 - FLEXOR CARPI ULNARIS
 - ILIOPSOAS
 - PATELLAR TENDON
 - ACHILLES TENDON
- MUSCLES TO CHECK –
 - LATISSIMUS DORSI
 - TERES MAJOR
 - LONG HEAD OF TRICEPS
 - ILIOPSOAS
 - SARTORIUS
 - GRACILIS

CONSERVATIVE SOFT TISSUE MANAGEMENT

- TENDINOPATHY & MUSCLE STRAIN TREATMENTS
 - SO MUCH THAT CAN BE DONE CONSERVATIVELY!!
 - REHAB NEEDS TO BE THE FIRST LINE OF DEFENSE FOR THESE CASES!
 - SO EVERYONE INVOLVED IN ANIMAL HEALTH CARE SHOULD KNOW HOW TO MOST EFFECTIVELY TREAT THESE SOFT TISSUE CASES!



THANKS FOR LISTENING!



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