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OF HEALTH BUSINESS AND TECHNOLOGY

Lecture 15 — Compartment Syndrome

Student Handout · RU RMT 20 Pathological Treatments · Ruhani College · Registered Massage Therapy Diploma Program

How to use this handout: it follows the lecture in the order it is delivered, so you can annotate it as we go rather than copying slides. Everything examinable in this lecture is here. Work through the review questions at the end without looking back, then check them against the answers.

Lecture Overview — Learning Objectives

Lecture 15 · Learning objectives

Rattray & Ludwig framework

Notes:

Six objectives. The non-negotiable one is the contraindication objective: acute compartment syndrome is a surgical emergency and must never be treated with massage — it must be referred immediately.

Describe the compartment — Explain fascial compartments and why they cannot expand under pressure.

Explain the pathophysiology — Trace the ischemia–edema cycle that drives rising intracompartmental pressure.

Distinguish acute vs chronic — Differentiate acute (ACS) from chronic exertional (CECS) compartment syndrome.

Assess and screen — Apply health-history, observation, palpation and ROM findings to recognise red flags.

Apply contraindications — Identify ACS as an absolute contraindication requiring emergency referral.

Plan safe treatment — Outline an appropriate massage and self-care plan for the chronic presentation.

Definition — What Is Compartment Syndrome?

Compartment syndrome occurs when pressure rises within a closed fascial compartment to a level that compromises the circulation and function of the tissues inside it.

A time-critical condition

In the acute form, irreversible muscle and nerve damage can begin within hours. Recognition speed determines outcome.

The fascia surrounding a muscle group is tough and inelastic. When swelling or bleeding increases the volume inside that fixed space, pressure climbs quickly. Rising pressure first collapses thin-walled veins, then capillaries, and finally arterial inflow — starving the muscle and nerve of oxygen.

Most common sites

The leg (especially the anterior compartment) and the forearm are the classic locations, though any compartment can be affected.

Lecture 15 · Definition

Rattray & Ludwig framework

Notes:

Core idea: a fixed container plus increasing contents equals dangerous pressure. The fascia does not stretch, so pressure has nowhere to go and the tissues inside lose their blood supply.

Anatomy — The Compartment Concept

Key principle: Fascia is strong but minimally compliant. A small rise in volume produces a large, non-linear rise in pressure — the compartment behaves like a sealed, unyielding container.

Lecture 15 · Anatomy of a compartment

Rattray & Ludwig framework

Notes:

Anatomy review: a compartment is bounded by bone, interosseous membrane and fascia. Because fascia barely stretches, the pressure–volume relationship is steep — this is why the condition escalates so fast.

Bone & interosseous membrane — Form the rigid inner walls that the compartment is built around.

Fascial sheaths & septa — Tough connective-tissue partitions divide a limb into separate compartments.

Muscles, vessels & nerves — Each compartment houses a functional group plus its supplying artery, vein and nerve.



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Regional Anatomy — The Four Compartments of the Leg

Anterior

Lateral

Superficial posterior

Deep posterior

Lecture 15 · Compartments of the leg

Rattray & Ludwig framework

Notes:

Four leg compartments. The anterior compartment is by far the most commonly affected in both acute and chronic forms — note the deep fibular nerve runs here, so first-web-space numbness and foot-drop are warning signs.

Most commonly affected — dorsiflexors. — Tibialis anterior, EHL, EDL, fibularis tertius. Deep fibular nerve. Anterior tibial artery.

Evertors of the foot. — Fibularis longus & brevis. Superficial fibular nerve.

Plantarflexors — the calf. — Gastrocnemius, soleus, plantaris. Sural nerve.

Often hardest to assess clinically. — Tibialis posterior, FDL, FHL, popliteus. Tibial nerve. Posterior tibial artery.

Regional Anatomy — Compartments of the Forearm

The forearm is the second classic site for acute compartment syndrome — often following a supracondylar fracture, crush injury or tight cast.

Volar (anterior)

Brachioradialis, ECRL, ECRB.

Most affected — site of Volkmann's contracture.

Less commonly involved.

Lateral muscle group of the forearm.

Lecture 15 · Compartments of the forearm

Rattray & Ludwig framework

Notes:

Forearm: the volar compartment is the danger zone. Untreated acute compartment syndrome here causes Volkmann's ischemic contracture — a permanent claw-hand deformity.

Dorsal (posterior) — Wrist & finger flexors, pronators. Median & ulnar nerves.

Mobile wad — Wrist & finger extensors. Posterior interosseous nerve.

Pathophysiology — The Pressure Cascade

Self-perpetuating: ischemia causes more swelling, which raises pressure further — the cycle accelerates until perfusion is restored.

Lecture 15 · Pathophysiology — pressure cascade

Rattray & Ludwig framework

Notes:

Walk the five steps. Emphasise that veins collapse before arteries, so a pulse may still be present even while the tissue is ischemic — pulselessness is a late and unreliable sign.

Trigger — Trauma, bleeding, swelling or external compression raises the volume inside the compartment.

Pressure rises — Inelastic fascia cannot expand, so intracompartmental pressure climbs steeply.

Venous collapse — Thin-walled veins are compressed first; venous outflow falls and back-pressure builds.

Capillary failure — Capillary perfusion pressure is exceeded; oxygen delivery to tissue stops.

Ischemia — Muscle and nerve become ischemic; further swelling worsens the pressure — a vicious cycle.

Pathophysiology — The Ischemia-Edema Vicious Cycle

More edema



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Tissue hypoxia

Swelling adds volume; pressure climbs again.

Muscle & nerve cells begin to suffer.

Rising

pressure

Cell injury & leak

Damaged cells leak fluid into the space.

Lecture 15 · Ischemia–edema cycle

Ratray & Ludwig framework

Notes:

The loop concept: hypoxia damages cells, damaged cells leak fluid, fluid raises pressure, higher pressure reduces perfusion further. It only stops when pressure is relieved.

Reduced perfusion — Each turn of the loop makes the next worse.

Why it matters — Without decompression the cycle does not self-correct.

Capillary flow falls; tissue oxygen drops. — This is why acute compartment syndrome is a true surgical emergency — only fasciotomy reliably breaks the cycle.

Classification — Two Distinct Presentations

Chronic Exertional (CECS)

Acute (ACS)

Surgical emergency

Activity-related, reversible

Sudden onset, usually after trauma or fracture

Gradual onset, brought on by exercise

Severe, escalating pain out of proportion to injury

Aching, cramping or tightness during activity

Pressure does NOT relieve with rest

Symptoms RESOLVE with rest within minutes

Lecture 15 · Acute vs chronic — overview

Ratray & Ludwig framework

Notes:

Two very different conditions sharing a name. The single most useful discriminator: acute pain does not ease with rest and keeps escalating; chronic pain reliably settles with rest.

Threatens limb viability within hours — Absolute contraindication — refer to emergency care

Common in runners and endurance athletes — Massage may help associated tension; refer for diagnosis

Part One — Acute Compartment Syndrome

A limb-threatening surgical emergency. The clinician's job is rapid recognition and immediate referral — never treatment.

Notes:

Section divider for acute compartment syndrome. Set the tone: this is the emergency. Everything in this section is about spotting it fast and getting the client to definitive care.

Acute · Etiology — What Causes Acute Compartment Syndrome?

Lecture 15 · Acute — causes

Ratray & Ludwig framework

Notes:



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Fracture is the number-one cause. Note the counter-intuitive ones: a tight cast and reperfusion after restored circulation. Any recent trauma plus escalating pain should raise suspicion.

Fractures — The leading cause — especially tibial shaft and forearm fractures, with associated bleeding and swelling.

Crush injuries — Severe soft-tissue trauma causes rapid swelling and muscle bleeding inside the compartment.

Reperfusion swelling — After restored blood flow (e.g. post-embolectomy), tissue swells dramatically.

Tight casts / bandages — External constriction prevents normal expansion and raises compartment pressure.

Burns & bleeding disorders — Circumferential burns and anticoagulated bleeds can both precipitate ACS.

Severe muscle overuse — Rarely, extreme exertion or prolonged limb compression in an unconscious patient.

Acute · Signs — The Six P's of Acute Compartment Syndrome

Pain

Paresthesia

Pressure

P

P

P

Pallor

Paralysis

Pulselessness

P

P

P

Lecture 15 · The six P's

Rattray & Ludwig framework

Notes:

The classic mnemonic. The teaching point: pain and paresthesia are the **EARLY**, reliable signs. Pallor, paralysis and pulselessness are **LATE** — waiting for a missing pulse means waiting too long.

EARLY — Severe, deep, escalating — out of proportion to the injury and worse on passive stretch. The earliest sign.

EARLY — Pins-and-needles or numbness in the nerve served by the compartment. An early, important sign.

EARLY — The compartment feels tense, firm and 'wood-like' on palpation.

LATE — Pale, cool skin from compromised circulation. A later sign.

LATE — Weakness then loss of movement as nerve and muscle fail. A late, ominous sign.

LATE — Absent distal pulse — a very late and unreliable sign; do not wait for it.

Acute · Signs — Recognising the Picture Early

Tense, firm compartment

The hallmark

Tight and 'wood-like' to palpation; tender over the whole muscle belly.

Pain out of proportion

Pain that is far more severe than the visible injury would explain, that keeps increasing, and that is not controlled by ordinary analgesia.

Worsening despite rest

Unlike most injuries, elevation and rest do not settle the pain.

Pain on passive stretch of the muscles in the compartment is one of the most sensitive early findings.

Neuro changes

Numbness, tingling, then weakness in the distribution of the compartment's nerve.



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Lecture 15 · Recognising ACS early

Rattray & Ludwig framework

Notes:

Drive home: pain out of proportion plus pain on passive stretch is the early combination. By the time pallor and pulselessness appear, the limb may already be compromised.

Acute · Management — A Surgical Emergency: Fasciotomy

Stop and refer immediately

THE CRITICAL WINDOW

Suspected ACS is a 911 / emergency-department situation. Do not massage, stretch or apply heat.

Fasciotomy

The surgeon opens the fascia to release pressure and restore perfusion; wounds are closed later.

Lecture 15 · Surgical emergency

Rattray & Ludwig framework

Notes:

Key safety teaching: with suspected acute compartment syndrome you do nothing therapeutic — you refer. And note the elevation point: unlike most swelling, you do NOT elevate the limb high, because that further reduces arterial supply.

6 hrs — Keep the limb at heart level — raising it further reduces arterial inflow and worsens ischemia.

Do not elevate above heart — Muscle necrosis can begin within roughly 4–6 hours of sustained pressure. Decompression is time-critical.

Acute · Consequences — Complications of Untreated ACS

Lecture 15 · Complications of untreated ACS

Rattray & Ludwig framework

Notes:

These complications are why the emergency framing matters. Volkmann's contracture is the classic forearm endpoint; rhabdomyolysis is the systemic danger that can threaten the kidneys and life.

Muscle necrosis — Ischemic muscle dies and is replaced by fibrous scar, causing permanent weakness.

Volkmann's contracture — In the forearm, scarring of dead flexors produces a fixed, claw-like deformity of the hand.

Permanent nerve damage — Prolonged ischemia of the compartment's nerve leaves lasting numbness and weakness.

Rhabdomyolysis — Breakdown products from dying muscle flood the bloodstream and can cause acute kidney failure.

Infection & amputation — Necrotic tissue may become infected; in severe cases the limb cannot be salvaged.

Systemic illness — Severe cases progress to electrolyte disturbance, shock and life-threatening complications.

Part Two — Chronic Exertional

Compartment Syndrome

An activity-induced, reversible rise in compartment pressure — the form a massage therapist is most likely to encounter in practice.

Notes:

Section two: the chronic exertional form. This is the one you will actually see in clinic — typically in a runner who aches predictably during exercise and recovers with rest.

Chronic · Etiology — Causes & Risk Factors of CECS

Repetitive-impact sport

The mechanism

Runners, especially distance and track athletes; also cyclists, skiers and soccer players.

Rapid training increases



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During exercise, working muscle can swell by up to 20%. In a tight, low-compliance compartment this transient swelling raises pressure enough to reduce blood flow, causing pain. Pressure normalises once activity stops — so symptoms are predictable and reversible.

A sudden jump in volume or intensity, or new hypertrophy, can outpace fascial compliance.

Biomechanics & technique

Forefoot strike, overpronation and certain gait patterns load the anterior compartment.

Younger athletes

Most common in active people under 40; affects both legs in most cases.

Lecture 15 · Chronic — causes & risk

Rattray & Ludwig framework

Notes:

Mechanism: exercise swells the muscle, the tight compartment can't accommodate it, pressure rises, flow drops, pain results — and it all reverses with rest. The classic patient is a young distance runner who ramped up mileage.

Chronic · Signs — Signs & Symptoms of CECS

Lecture 15 · Chronic — signs & symptoms

Rattray & Ludwig framework

Notes:

The signature pattern: comes on at a predictable point in exercise, forces a stop, and clears with rest. If pain does NOT clear with rest, think acute or another diagnosis and refer.

Predictable timing — Aching, cramping or tightness that begins after a fairly consistent time or distance into exercise.

Activity-dependent — Builds as activity continues; severe enough to force the athlete to slow down or stop.

Relieved by rest — Settles within minutes of stopping — the defining feature versus the acute form.

Possible neuro symptoms — Numbness, tingling or transient foot-drop may appear at peak exertion, then resolve.

Often bilateral — Frequently affects both legs and the same compartment on each side.

Tightness / fullness — A sense of swelling or muscle hardness in the affected compartment during activity.

Chronic · Epidemiology — Who Tends to Develop CECS?

Anterior

< 40

Lecture 15 · Chronic — epidemiology

Rattray & Ludwig framework

Notes:

Profile: young, active, anterior compartment, often both legs. The activity history usually points to a recent change in load.

Both legs — Most commonly involved compartment of the leg in CECS.

compartment — Typically affects younger, athletically active adults.

years — CECS is frequently bilateral and symmetrical.

in most cases — Clinical note: Symptoms often appear once an athlete increases training load. A careful activity history frequently reveals the trigger.

Classification — Acute vs Chronic: Side by Side

| Feature | Acute (ACS) | Chronic Exertional (CECS) |

| --- | --- | --- |

| Onset | Sudden, post-trauma | Gradual, exercise-induced |

| Pain & rest | Persists / escalates at rest | Resolves within minutes of rest |

| Severity | Limb-threatening emergency | Disabling but not dangerous |



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| Typical cause | Fracture, crush, tight cast | Repetitive sport, training spike |
| Massage role | Absolute contraindication — refer 911 | May help; refer for diagnosis first |

Lecture 15 · Acute vs chronic comparison

Rattray & Ludwig framework

Notes:

Use this as the consolidation slide. If a student remembers only one row, make it the last: acute is a 911 contraindication; chronic can be worked with, but only after medical diagnosis.

Assessment — Differential Diagnosis — Leg Pain

Several conditions mimic exertional leg pain. Distinguishing them guides safe treatment and appropriate referral.

Lecture 15 · Differential diagnosis

Rattray & Ludwig framework

Notes:

Differentials matter for safety. DVT is the critical one — unilateral resting calf pain with warmth and swelling is a contraindication to massage and an emergency referral, not a CECS.

Medial tibial stress syndrome — Diffuse pain along the posteromedial tibial border ('shin splints'); often eases as activity warms up.

Tibial stress fracture — Focal, point tender bony pain that worsens with continued loading; needs imaging.

Popliteal artery entrapment — Vascular claudication-type pain; pulses may change with ankle position — refer.

Deep vein thrombosis — Unilateral calf pain, warmth and swelling at rest — a medical emergency; never massage.

Nerve entrapment / radiculopathy — Pain following a nerve or root distribution, often with back involvement.

Tendinopathy / muscle strain — Localised to a specific tendon or muscle, reproduced by resisted testing.

Assessment · Subjective — Health History

Lecture 15 · Assessment — health history

Rattray & Ludwig framework

Notes:

The history does most of the diagnostic work here. The two questions that matter most: how did it start, and does rest relieve it? Those two answers separate emergency from manageable.

When and how did it start? — Sudden onset after trauma points to acute; gradual onset with exercise points to chronic.

What brings it on and relieves it? — Pain that escalates and persists vs pain reliably relieved by rest — the key discriminator.

Recent injury, surgery or cast? — Fracture, crush, reperfusion or a tight cast raises suspicion for acute compartment syndrome.

Activity & training history — New or increased running mileage, intensity or technique change supports CECS.

Neuro symptoms? — Numbness, tingling or weakness, and whether they resolve with rest or persist.

Red-flag screen — Resting calf pain, swelling, warmth, or escalating pain — screen for DVT and acute CS.

Assessment · Objective — Observation & Inspection

Lecture 15 · Assessment — observation

Rattray & Ludwig framework

Notes:

Always compare side to side. For CECS, the most informative observation is often comparing the limb at rest versus immediately after the provoking activity.

Skin & colour — Note pallor, redness, shininess or bruising over the compartment; compare both limbs.

Swelling & contour — Visible fullness or a tense, bulging muscle belly suggests raised compartment volume.

Posture & gait — Antalgic gait, foot-drop or a guarded limb; observe before and (for CECS) after exertion.

Functional capacity — Whether the client can weight-bear and move the ankle/toes through full range.



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Assessment • Objective — Palpation

Tenderness over the whole muscle belly, not just one point

Temperature differences compared with the other limb

Do not apply pressure, deep work, friction or stretch to a suspected acute compartment. Stop the assessment and refer for emergency evaluation.

Distal pulses and capillary refill as a circulation check

Skin texture, swelling and any local warmth

Lecture 15 • Assessment — palpation

Rattray & Ludwig framework

Notes:

Palpation gives the 'tense, wood-like' sign. But the moment palpation suggests acute compartment syndrome, you stop — you do not keep probing or treating a limb that may be ischemic.

What you are feeling for — Compartment tension — firmness or a tense, 'wood-like' quality

Palpation caution — A tense, exquisitely tender, 'wood-hard' compartment in a client with escalating pain is a red flag for acute compartment syndrome.

Assessment • Objective — Range of Motion Testing

AF

PR

Lecture 15 • Assessment — ROM

Rattray & Ludwig framework

Notes:

AF, PR, AR. The standout finding is pain on passive stretch in PR testing — that, with disproportionate pain, is a hallmark of the acute form.

AR — Client moves the joint alone. Pain, limited range or weakness may appear, especially after exertion in CECS.

Active free — Therapist moves the joint. Pain on passive STRETCH of the compartment's muscles is a classic acute warning sign.

Passive relaxed — Tests muscle strength. Weakness can reflect ischemic or nerve involvement within the compartment.

Active resisted — Watch for: pain on passive stretch combined with escalating rest pain — together these strongly suggest acute compartment syndrome.

Assessment • Medical — Medical Diagnostics

Lecture 15 • Medical diagnostics

Rattray & Ludwig framework

Notes:

These are the physician's tools, not ours, but knowing them helps you communicate. Intracompartmental pressure measurement is the gold standard; for CECS it's done around exercise to catch the spike.

Intracompartmental pressure — A needle manometer measures pressure directly. Sustained elevation, or a small gap between compartment and diastolic pressure, confirms the diagnosis.

Exercise provocation testing — For CECS, pressure is measured before and after the provoking exercise to capture the transient rise.

Imaging & vascular studies — MRI, ultrasound or vascular tests help exclude stress fracture, DVT and arterial entrapment.

Clinical diagnosis — Acute CS is diagnosed clinically and treated urgently — investigations must not delay surgery.

Stop & Refer Immediately — Red Flags Requiring Emergency Care

Pain out of proportion that keeps escalating and is not relieved by rest

A tense, firm, 'wood-hard' compartment that is exquisitely tender

Pain dramatically increased by passive stretch of the muscles

Progressive numbness, tingling or weakness in the limb



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Recent fracture, crush injury, surgery or a tight cast

Pale, cool, or pulseless limb (late signs — do not wait for these)

Lecture 15 · Red flags

Rattray & Ludwig framework

Notes:

This is the safety slide. If any of these appear, the treatment plan is the same: stop, refer urgently, document. When in doubt, refer — the cost of missing acute compartment syndrome is a limb.

Contraindications — Acute CS — Absolute Contraindication

Pressure & heat worsen it

Compression, deep work and heat all increase compartment volume or pressure.

Your role is referral

Recognise, reassure, and direct the client to emergency care without delay.

Lecture 15 · Contraindication — acute

Rattray & Ludwig framework

Notes:

State it plainly: acute compartment syndrome is an absolute contraindication. Heat, compression, and deep work all make it worse, and any treatment time is dangerous delay.

Delay costs the limb — Any time spent on massage delays the surgery the limb actually needs.

Never treat — Suspected acute compartment syndrome is an absolute contraindication to massage therapy. There is no scenario in which hands-on treatment is appropriate.

Contraindications — Chronic CS — Cautions & Local Limits

CECS is not an emergency, but treatment is supportive and proceeds only after medical diagnosis. Observe these cautions:

Lecture 15 · Cautions — chronic

Rattray & Ludwig framework

Notes:

For chronic, the rule is: diagnosis first, then supportive work within tolerance. Stay alert — if symptoms ever stop resolving with rest, you re-screen for the acute form.

Refer for diagnosis first — Confirm CECS (and exclude DVT, stress fracture, vascular causes) before any vigorous work.

Avoid deep work during a flare — Do not perform deep or sustained pressure on an acutely symptomatic, tense compartment.

Cautious heat — Avoid aggressive heat over a symptomatic compartment; it can increase local swelling.

Monitor neuro symptoms — If numbness, weakness or escalating pain appear, stop and re-screen for the acute form.

Respect post-exertion timing — The compartment is most reactive right after exercise — adjust intensity accordingly.

Stay within tolerance — Work to comfortable tolerance; treatment supports, but cannot resolve, the structural issue.

Part Three — Treatment of the Chronic

Presentation

Massage cannot reverse the structural compliance problem — but it can ease associated muscle tension, support recovery, and improve the client's comfort and function.

Notes:

Section three. Set expectations honestly: massage is supportive, not curative, for CECS. Definitive treatment of refractory CECS is activity modification or surgical fasciotomy — our role is comfort, associated tension, and self-care.

Treatment · Approach — Treatment Goals & Set-Up

Address compensating muscles and altered gait patterns

Avoid sustained compression of a symptomatic compartment



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Improve tissue mobility and general circulation
Treat outside of acute post-exertion flare where possible
Support recovery between training sessions
Keep the limb at a neutral, well-supported position
Educate on load management and self-care
Re-screen circulation and neuro status before deep work

Lecture 15 · Treatment — goals & set-up

Rattray & Ludwig framework

Notes:

Goals are supportive: ease tension, address compensations, support recovery, educate. Positioning is about comfort and avoiding sustained compression of a reactive compartment.

Treatment goals — Reduce tension in the affected and surrounding muscles

Positioning & timing — Comfortable prone or supine with the leg supported

Treatment · Techniques — Massage Techniques

Lecture 15 · Treatment — techniques

Rattray & Ludwig framework

Notes:

A standard graded approach: warm, then petrissage, trigger points, gentle fascial work, and crucially treat the whole kinetic chain. Always within tolerance, never forcing through guarding.

Warming & effleurage — Begin superficially to warm tissue, assess tone and improve circulation before deeper work.

Petrissage & kneading — Address general tension in the calf and surrounding muscles within comfortable tolerance.

Trigger-point release — Treat trigger points in the affected and compensating muscles to reduce referred pain.

Myofascial techniques — Gentle fascial work to improve tissue glide and mobility around the compartment.

Treat the kinetic chain — Include hip, thigh, foot and opposite limb to address gait-related overload.

Gentle, graded depth — Progress depth gradually; never force through guarding or provoke neuro symptoms.

Treatment · Techniques — Fascial & Mobility Work

Cross-fibre & skin rolling

Mobilise superficial fascia and reduce adherence in surrounding tissue.

Important: manual work does not surgically release the fascia — set realistic expectations with the client.

Joint & muscle mobility

Restore ankle, foot and knee mobility to reduce mechanical overload.

Lecture 15 · Treatment — fascial work

Rattray & Ludwig framework

Notes:

Fascial work makes conceptual sense because fascia is the limiting structure — but be honest that manual therapy doesn't replicate a fasciotomy. It improves comfort and glide, not the compartment's capacity.

Slow fascial spreading — Gentle, sustained techniques to encourage tissue glide around the compartment.

Why fascia? — Because the fascial sheath is the unyielding wall of the compartment, improving the glide and pliability of surrounding fascia and managing tissue tension is a logical focus for supportive care.

Treatment · Adjuncts — Hydrotherapy Applications

Never apply heat to a suspected acute compartment or an acutely swollen, tense compartment — heat increases volume and pressure.

Lecture 15 · Hydrotherapy



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Rattray & Ludwig framework

Notes:

Hydrotherapy is adjunctive and cautious. The hard rule: no heat on a suspected acute compartment or an actively swollen one. Cool after exertion is the safer default for CECS.

Cool after exertion — Cool applications after the provoking activity may help limit post-exercise swelling and discomfort.

Gentle warmth between flares — Mild heat away from a symptomatic flare can relax surrounding muscle and aid general circulation.

Contrast (with caution) — Alternating temperatures can stimulate local circulation — use conservatively and monitor response.

Treatment · Self-Care — Remedial Exercise & Stretching

Lecture 15 · Remedial exercise

Rattray & Ludwig framework

Notes:

Self-care is where lasting change happens for CECS: graded loading, mobility, gait and technique, and recovery. Often delivered in collaboration with a physiotherapist or coach.

Gentle stretching — Stretch the affected and antagonist muscle groups within comfort to maintain mobility.

Mobility & ROM — Ankle and foot mobility work to support normal mechanics and tissue glide.

Graded loading — Reintroduce activity progressively, respecting symptom thresholds and recovery time.

Gait & technique — Address running form, footwear and surface in collaboration with the client's coach or therapist.

Strength balance — Balance strength around the ankle and lower leg to distribute load more evenly.

Rest & recovery — Plan adequate recovery between sessions; encourage early reporting of warning symptoms.

Treatment · Education — Client Self-Care & Home Advice

Warm up, cool down and stretch consistently

Apply cool after provoking exercise as advised

Empowering self-monitoring is itself a safety intervention — it helps the client catch a transition to the acute form early.

Review footwear, surfaces and running technique

Report any change in pain or new numbness early

Lecture 15 · Self-care & education

Rattray & Ludwig framework

Notes:

Client education does double duty: it improves outcomes for CECS and it builds in a safety net, because the client learns to recognise the warning signs of the dangerous acute form.

Encourage the client to: — Modify training load and progress gradually

Teach the warning signs — Make sure the client knows that pain which does not ease with rest, keeps worsening, or comes with spreading numbness is NOT normal and needs urgent medical assessment.

Outcomes — Prognosis & Expected Outcomes

Acute (ACS)

Chronic (CECS)

Excellent if decompressed early enough

Generally good; not limb-threatening

Delayed treatment risks permanent deficit

Many improve with activity modification

Lecture 15 · Prognosis

Rattray & Ludwig framework



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Notes:

Two prognostic stories. Acute: outcome is all about timing — fast decompression usually means full recovery. Chronic: a good prognosis overall, with conservative management first and surgery reserved for refractory cases.

Outcome depends almost entirely on speed — Possible contracture, weakness or nerve loss if late

Massage supports comfort and recovery — Refractory cases may need surgical fasciotomy

Applied Learning — Clinical Scenario

Most likely

Anterior CECS — predictable, exertional, bilateral, relieved by rest, with a recent training spike.

Massage plan

Supportive work on the anterior/lateral leg and kinetic chain; education on graded loading.

Safety check

If pain ever fails to settle with rest or numbness escalates — re-screen for the acute form.

Lecture 15 · Clinical scenario

Rattray & Ludwig framework

Notes:

Work the case with the class. The pattern screams anterior CECS, but the disciplined answer still routes through medical diagnosis first, then supportive treatment, with the built-in safety check.

The presentation — Refer for medical diagnosis to confirm and to exclude stress fracture and vascular causes.

Action — A 26-year-old runner reports aching tightness in the front of both shins that begins about 15 minutes into every run, becomes severe enough to force a walk, and disappears within 10 minutes of stopping. No trauma. Symptoms began after doubling weekly mileage.

Summary — Key Takeaways

Lecture 15 · Key takeaways

Rattray & Ludwig framework

Notes:

Recap the six. If they leave with one sentence: acute is a 911 emergency and absolute contraindication; chronic is exertional, reversible, and supportable after diagnosis. When in doubt, refer.

Fixed container, rising pressure — Compartment syndrome is increased pressure in a non-expandable fascial space that chokes off perfusion.

Acute is an emergency — Sudden, escalating, rest-resistant pain after trauma — an absolute contraindication; refer to 911.

Chronic is exertional & reversible — Predictable activity-related pain that resolves with rest — manageable, but diagnose first.

Assessment screens for red flags — History and exam separate the dangerous acute form from the supportable chronic one.

Massage supports, not cures CECS — Ease associated tension, treat the kinetic chain, and educate on load and warning signs.

When in doubt, refer — Missing acute compartment syndrome can cost a limb — err firmly on the side of caution.

Questions & Discussion

Thank you — let's discuss any cases or questions.

Selected references

Rattray, F. & Ludwig, L. — Clinical Massage Therapy: Understanding, Assessing and Treating Over 70 Conditions. Talus Inc.

Standard orthopaedic and sports-medicine references on acute and chronic exertional compartment syndrome.

Course anatomy and pathophysiology materials for the lower leg and forearm compartments.

Lecture 15 · References & questions

Rattray & Ludwig framework

Notes:



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Close out. Primary text is Rattray & Ludwig. Invite the students' own clinical questions and any cases they want to reason through together.

Review questions

Answer these from memory before checking the answers below.

1. Define compartment syndrome.
2. Why does pressure rise so readily within a compartment?
3. Distinguish acute compartment syndrome from the chronic exertional form.
4. What is the single most important clinical judgement in this lecture, and why?
5. How is the chronic exertional form treated by massage, and when?

Answers

1. A condition in which pressure rises within a closed fascial compartment to a level that compromises the circulation and function of the tissues inside it.
2. Because the fascia surrounding a muscle group is tough and inelastic. When swelling or bleeding increases the volume inside that fixed space, pressure climbs quickly — first collapsing veins, then capillaries, and finally arterial inflow.
3. Acute compartment syndrome follows trauma, is rapidly progressive and threatens the muscle and nerve within hours. Chronic exertional compartment syndrome develops predictably with exercise, builds over minutes of activity and resolves with rest.
4. Recognising acute compartment syndrome as a medical emergency and an absolute contraindication to massage. It requires immediate referral, because irreversible muscle and nerve damage begins within hours and recognition speed determines the outcome.
5. Only outside an episode, and only once the acute form has been excluded. Treatment warms and softens the compartment and surrounding muscles, addresses trigger points and fascial restriction to improve tissue glide, treats the kinetic chain contributing to overload, and progresses depth gradually — never forcing through guarding or provoking neurological symptoms.