

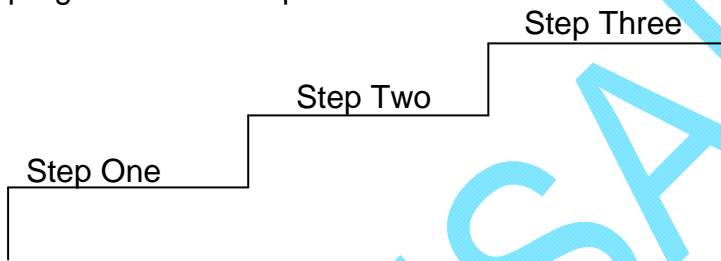
Analgesia for **Adult Limb Reconstruction Patients in External Fixation Devices.**

Pain is a subjective experience and every patient has different coping mechanisms, different tolerances to pain and of course the frame treatments are all slightly different with varying difficulties for the patient to cope with.

Patients in Ilizarov fixation for limb lengthening or correction of deformity will nearly always require analgesia during their frame treatment time, especially during that period of “adjustment of the framework”.

Some patients require high doses of Morphine (or equivalent drug) towards the last third of the adjustment period, gradually reducing off the analgesia following completion of the frame adjustments.

Whilst the patient is in hospital they are taught about what level of pain they should expect to happen during their frame treatment time and the usual progression of that pain.



Analgesia is taught in a “**step by step**” process beginning with a mild non-opioid analgesia on step one, encouraging the patient to increase to the next “step” analgesia on the 4th to 5th day of distraction. It is usually at this period that patients experience what they refer to as “growing pains”

“Growing pains” are due to the stretching (or lengthening) of the patient’s soft tissues, not due to the bony distraction.

Patients are at higher risk of a pin tract infection during the frame adjustment period. As the frame gradually alters the shape of the limb, the wires and pins gently “tear” through the skin. Pin infection must be treated as soon as clinically suspected as the patient’s frame adjustments **have to continue** in order to prevent the new regenerate bone from maturing too early.

During the first few days of a pin tract infection the patient may also need a short course of higher strength analgesia.

Patients are taught to perform exercises to the peripheral joints around the frame to encourage tendons to become stretched to their new or desired length.

Patients are taught to perform these exercises for 20 minutes at each adjustment of the frame, that is, 4 times a day.

Analgesia **may need to be increased** as the patients limb becomes longer to allow the patient to continue with the exercises.

If the patient is unable to perform the exercises to lengthen tendons, we may have to **abandon the limb lengthening** to allow the soft tissues *time* to “catch-up” with the new length of the limb.

In some cases, we may be able to then continue to lengthen at a slower rate (But only if the new bone, termed “the regenerate” has not calcified during our “catch-up” or resting period)

Some patients experience **neuropathic pain** due to the stretching of nerves or wires closely located to nerves. These patients may need an adjunctive treatment such as Amitriptyline Hydrochloride, a tricyclic antidepressant also licensed for use in neuropathic pain (starting at e.g. 25mg nocte) prescribed in lower doses than in depressive illness. We may also need to stop the distraction for a time or reverse the distraction to ensure that the nerve is not damaged.

Some patients experience **muscle spasm**. This is more often experienced in limb lengthening of the femur with the large thigh muscle groups. These patients may need an adjunctive treatment such as a benzodiazepine (starting at e.g. 2-5mg prn 6 hrly) commonly Diazepam the first choice, but used in the short term only due to its addictive quality. Baclofen is an alternative drug also useful in muscle spasm (starting at e.g. 5mg 8hrly)

Approximately one to two weeks after completing their frame adjustments the level of pain decreases dramatically. It is at this stage we aim to **step-down** the strength of analgesia.

The ranges of analgesia used vary from paracetamol alone to Morphine Sulphate tablets with adjunctive treatments.

This style of teaching patients “the step-by-step” process comes from the World Health Organisation (WHO) three-step analgesic ladder for the control of pain (WHO 1996)

It ascends from mild pain at the bottom of the ladder to moderate to severe pain at the top of the ladder. At each level, the ladder suggests the consideration of adjunctive therapy. These include therapies such as Non-Steroidal Anti-inflammatory (NSAID)

Step one suggests non-opioid analgesia with or without a NSAID.

Step two suggests a weak opioid plus paracetamol with / without an adjunctive therapy (NSAID, tricyclic for neuropathic pain)

Step three suggests strong opioids such as morphine with or without adjunctive treatments.

In Ilizarov Method we use the step by step process but we **DO NOT USE** the **NSAID** group of drugs.

Patients undergoing the Ilizarov Method are encouraged not to use NSAID's as they may reduce the body's ability to produce bone (Hogevold, Groggaard & Reikeras, 1992) (Bandolier 2004)

For this group of patients who have to make independent decisions (with advice via the Limb Reconstruction team mobile or their GP) on when to increase and decrease their analgesia according to frame adjustments, it is much safer to use non-compound drugs.

For example; instead of using the compound drug of Tylex® we would offer the patient the separate active ingredients of the Tylex® which are paracetamol and codeine.

A combination of Codeine 60mg and Paracetamol 1g given regularly every 6 hours is shown to have a NNT(Number Needed to Treat) on the Oxford League Table of Analgesic Efficacy of 2.2 which is excellent.

This compares to Intramuscular Morphine 10mg or Intramuscular Pethidine 100mg, both having NNT of 2.9.

NNT are calculated for the proportion of patients with at least 50% pain relief over 4-6 hours compared with placebo in randomised, double-blind, single dose studies in patients with moderate to severe pain. (Bandolier 2005)

We attempt to have the patient on analgesics which are administered at 6 hourly intervals. This allows the patient to take their analgesia at the same time as the frame adjustment.

The patient will not experience any pain from physically adjusting the Dice nuts on the frame but may experience "growing pains" approximately 30-40 minutes after the adjustment. This is due to the soft tissues being stretched out to their new length. If the patient takes analgesia at the same time as the adjustment, it should be actively working at the time of the expected "growing" pains.

It is commonplace for limb reconstruction patients towards the last third of the frame adjustment period to be on substantive doses of morphine (or its equivalent)

In the majority of adult patients requiring morphine, we would offer a starting dose of 20mg sustained release every 12 hours. This would be supplemented with an Oral Morphine Solution usually 10mg in a 5ml solution taken prn up to 6hrly max 40mg in 24 hours.

The prescription for the Morphine should be offered in the **10mg sustained release tablet** to allow the patient to increase the 12 hourly dose (if required, and only after consultation with the team or GP) in 10mg increments, for example increasing from 20mg every 12 hours to 30mg every 12 hours the following week and so on. The aim would be to have the patient comfortable on the background sustained release morphia to enable them to mobilise in and out of their home (return to work, college etc) using the faster acting Morphine sulphate solution 6 hourly to assist with the 6 hourly periods of exercise to lengthen soft tissues.

During the first couple of weeks following completion of the limb lengthening or correction of deformity (when the frame is locked but remains on the limb) the soft tissue of the patients limb will gradually relax and become much more comfortable. At this point we would offer the patient a plan to reduce the morphine gradually week by week until the patient is back on the Codeine Po4 with Paracetamol combination. As time progresses analgesia is required less and often only used for the occasional tender (or infected) pin site.

The following is a guide only:

	<i>Time in Frame Treatment</i>	<i>Approx length of Regenerate / Limb</i>	<i>Analgesia Plan</i>	<i>Are Adjunctive treatments needed?</i>
<i>Step One</i>	Week 1-2 post op	1cm	6hrly Paracetamol 1g & 6hrly Codeine PO4 60mg	Reassurance!
<i>Step Two</i>	Week 4	2.5cm	6hrly Paracetamol 1g & 6hrly Codeine PO4 60mg with occasional fast-acting morphine sulphate solution (10mg in 5ml solution, prn up to 6hrly max per 24hrs)	Hot baths to relax limb!
<i>Step Three</i>	Week 6	3.5-4cm	6hrly Paracetamol 1g & 6hrly Tramadol Hydrochloride Tablets 50-100mg (max 400mg in 24 hrs) OR Consider conversion to slow release Morphine Sulphate Tablets (or Oxycodone Hydrochloride SR) with occasional quick acting morphine sulphate solution (titrate to patient weight & need)	Muscle Spasm? Baclofen / Diazepam (short term only) Neuropathic pain? Amitriptyline or Gabapentin Slow down the frame adjustments?
		All frame adjustments were completed 2 weeks ago	Attempt to return to Step 2	

Patients are encouraged to phone the team for advice on their pain management.

These patients receive a massive amount of information while in hospital to enable them to be independent and may simply forget some information when at home and need reminding.

Risks on non-concordance would be un-acceptable pain that may prevent the patient from mobilising or performing exercises which are a vital part of the treatment. It may also risk the new regenerate bone from calcifying too early essentially causing abandonment of the limb lengthening.

We encourage patients to try and live their lives as normally as possible during the frame treatment which includes the distractions of returning to school, college or work if possible.

UNEXPLAINED EPISODES OF PAIN

Potential Cause of unexplained pain	Potential signs & symptoms	Suggested Plan
Deep Vein Thrombosis	Sudden increase in pain in limb around deep veins + limb swelling, (+/- pitting oedema) +/- skin changes	Organise urgent Duplex scanning of the limb. For more information Link to NICE Guidelines on Deep Vein Thrombosis at: http://www.nice.org.uk/guidance/index
Compartment Syndrome	Severe pain in the limb at a level which is “out of proportion” to the current injury and treatment. Pain is aggravated by passive muscle stretch. Occasionally, sensory loss in the nerves traversing the affected compartment (Pearse et al)	This is a limb threatening emergency situation. Admit patient to nearest A & E Department for further assessment & treatment. However, it is extremely unlikely for a patient to develop a compartment syndrome following discharge for limb reconstruction treatment.
Broken Tension Wire or Broken Pin	Sudden “crack” noise in limb (+/- frame) then acute sharp pain, now intermittent when weight-bearing (wire or pin broken inside limb) Or Obvious broken wire or pin on external construct	Apply pressure using your thumb to each side of the wire on the external construct. No movement should be felt on the highly tensioned wire, and the patient should not experience pain. If either of the above are positive signs, presume a wire or pin has broken, contact the team for further advice on continuing frame adjustments and ask the patient to be Non-weight-bearing until seen.

UNEXPLAINED EPISODES OF PAIN

<p>Pin Site Infection (Grades 2 to 6)</p> <p>Grade 2</p>	<p>Minor grade 1-2: Pain at the skin/ pin interface +/- leakage +/- redness or erythema</p>	<p>Swab for culture & sensitivity, start immediately on oral anti-staphylococcal antibiotic for 10 days. Increase local pin site care to 12 hourly instead of daily, isolate that pin site from other sites by using a dressing.</p>
<p>Pin Site Infection Grades 3</p>	<p>Minor grade 3: Pain at the skin so severe that patient having trouble mobilising + Limb Swelling + Redness or erythema or cellulitis +/- Pyrexia.</p>	<p>Seek advice from the team regarding admission for treatment.</p> <p>Admit for short course IV anti-staphylococcal antibiotics + elevation of limb + higher strength analgesia.</p> <p>Swab for culture & sensitivity Increase pin site care to 12hourly instead of daily, isolate that pin site from leaking on other sites by using a dressing.</p> <p>Obtain x-ray to check for reaction along wire or pin. If positive: seek advice from team on removing wire or pin.</p>
<p>Pin Site Infection Grades 4-6</p>	<p>Advice should be sought from the Limb Reconstruction Team regarding urgent admission and treatment at the Bone Infection Unit.</p>	<p>Advice should be sought from the Limb Reconstruction Team regarding urgent admission and treatment at the Bone Infection Unit.</p>

<p>Pain following a fall onto the framed limb</p>	<p>Bleeding pin tract where trauma has caused tearing of the skin around a pin site. Check the frame stability, are all the nuts tight? Any wires broken? Has the limb position changed?</p>	<p>Call the Team for advice. Ask patient to be non-weight-bearing until seen by the team.</p>
<p>Pain or sensory loss (or changes) in the limb</p>	<p>Contact team ASAP Neuropathic pain or sensory loss (or change) within the limb. Potential stretching of a nerve or trauma from a wire or pin.</p>	<p>Contact Team ASAP Ask patient to stop all adjustments until seen by team (within 48 hours) It may be appropriate to "reverse" the adjustments for 24 hours.</p>
<p>Pain following removal of the external frame</p>	<p>Contact team ASAP Acute or chronic pain in the limb post removal of the frame is unusual and re-fracture must be suspected until excluded.</p>	<p>Contact Team ASAP Ask patient to be Non-weight-bearing, return to using 2 crutches, rest as much as possible, it may be appropriate to place the limb in a resting cast until seen, must be seen by team within 48 hours.</p>

References

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No NSAIDS