

Trauma and Orthopaedics

Patient Information following application of an external fixator



What is external fixation?

It is a way of stabilising pieces of broken bone using an external framework of rods, wires and rings rather than internal metalwork. This can sometimes be used as a temporary frame which allows soft tissues to settle or can also be used for longer periods of time for a number of reasons.

These are listed below:

- Fixation of fractures especially a fracture with more than two to three pieces.
- Non-union of a fracture (the bones not healing) or an infected fracture.
- Correction of bony deformities.
- Lengthening of a limb that cannot be done with a limb lengthening (self-distracting) nail.
- Correction of soft tissue deformities.
- Arthrodesis (fusing of a joint).
- A bone defect which will need new bone to grow.

Types of frame



**Temporary
Frame**



**Taylor Spatial
Frame**



Ilizarov Frame

With a temporary frame you will not be able to put weight on the limb. The temporary frame will be converted to either a nail inside the limb or a Taylor Spatial Frame (TSF) which is the circular frame outside the body. The treatment depends upon the fracture/break.

With a circular frame you are likely to be encouraged to weight bear through the limb. This is to promote and stimulate bone formation. You will be guided by the team regarding whether you can put weight through your limb or not.

Taylor Spatial Frames are predominantly for fixation of fractures. The length of time the frame is worn can vary depending on healing and any deformity corrections required.

An Ilizarov frame is a very simple frame that only moves bone up or down, whilst a TSF will allow movement of the bone, in more directions to move the fracture to the correct position. A TSF is also much easier to adjust for more complex fractures.

Bone transport

As well as a TSF to support the fracture, bone transport may also be required. The first part of this process is done in theatre, the surgeon will cut/break healthy bone (corticotomy) above or below the break (fracture). The bone will then be moved either up or down using the frame. This is done by using clickers mounted into your frame. In general you will be advised to do 1 click per clicker 4 times per day

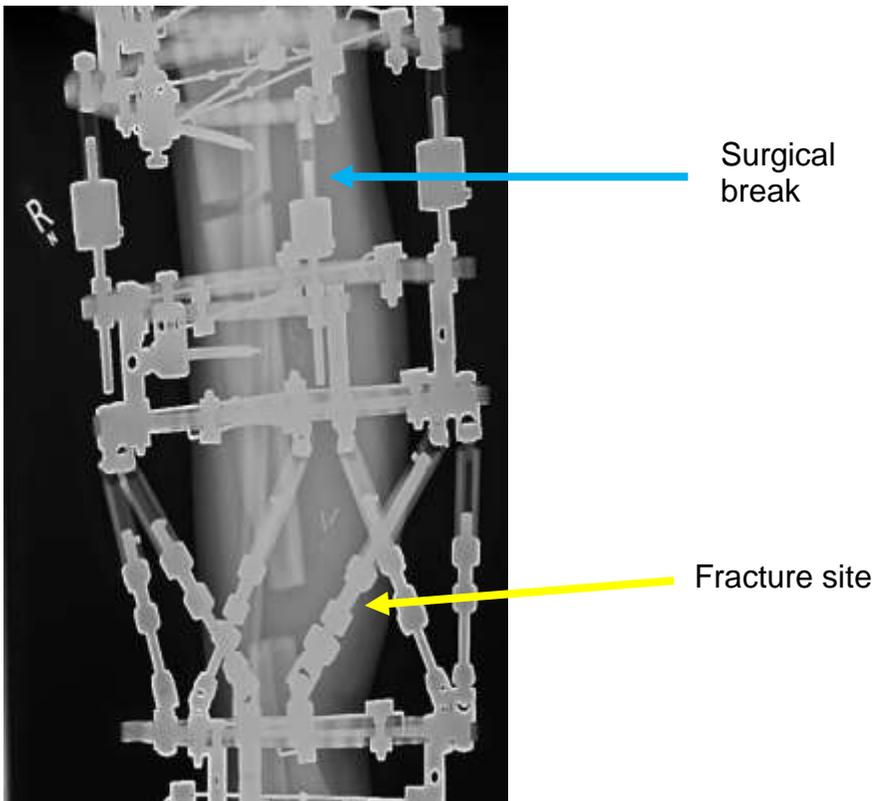
This will dock (link) the bone onto the fracture site in the correct position and healthy bone will grow in the cut or break that was made in theatre.

The bone transport frame is in addition to the TSF, which uses the body's natural ability to grow healthy new bone and soft tissue. This means that the bones can be moved into the correct position.

Bone transport with the extra frame has adjustable struts that get moved following the prescription, which is generated on computer software for each patient individually. This prescription will be given to

you whilst you are in hospital and when you attend clinic if further adjustments are required.

A TSF X-ray image showing where the healthy bone has been cut (the blue line) the second line shows the fracture (the yellow Line).



Frame adjustments

During the time you are wearing the frame you may be asked to complete frame adjustments to help with the alignment or lengthening of the bone as it heals. A frame “prescription” will be given to you by the team and you will be shown how to adjust the frame. This prescription is a computer generated prescription which will show you a list of numbers in a table from 1-6. This relates to each strut and its number.

The frame adjustment is done daily and will usually be 1-2mm per day. Each strut is numbered and colour coded so you can identify from the prescription which strut to alter.

The Taylor Spatial frame

The team will give you your prescription either whilst you are in hospital or at your out patients appointment. They will go through it with you and explain how it works. Once you have done your frame adjustment for the day it is advisable to tick or cross through that day so that you do not get confused. The dates are written in the American format so for example 12/19/2019 actually means the 19th December 2019.



The prescription

You will be given the prescription in this format whilst in hospital and in clinics as required. This is an A4 piece of paper, which you tick each day when adjusted your frame as instructed by the prescription.

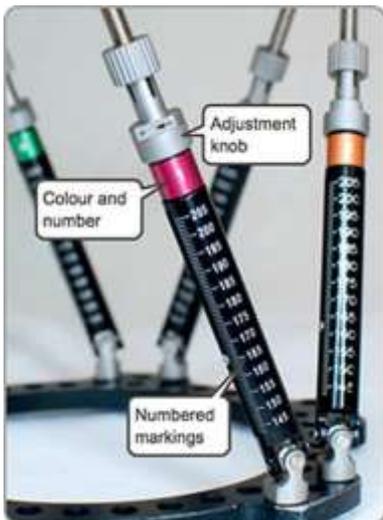
The Prescription is intended to be given to the Patient or the Patient's Caretaker

FULLSTOCK WOODS

Date	WkDay	Day	Strut 1	Strut 2	Strut 3	Strut 4	Strut 5	Strut 6	Actions
02/07/20	Fri	0	85	96 *	104	109	95	152	
02/08/20	Sat	1	86	96 *	106	110	95	152	
02/09/20	Sun	2	86	97	107	112	95	153	
02/10/20	Mon	3	87	97	109	113	94	153	
02/11/20	Tue	4	88	98	111	114	94	153	
02/12/20	Wed	5	88	99	113	118 *	94	153	
02/13/20	Thu	6	89	99	114	117 *	94	154	
02/14/20	Fri	7	89	99	116 *	118 *	93	154	
02/15/20	Sat	8	90 *	99	118 *	120 *	93	154	
02/16/20	Sun	9	91 *	100	120 *	121 *	93	154	
02/17/20	Mon	10	91 *	100	121 *	122 *	93	155	
02/18/20	Tue	11	92 *	100	123 *	123 *	92	155	
02/19/20	Wed	12	93 *	101	125 *	126 *	92	155	
02/20/20	Thu	13	93 *	101	126	126	92	156	
02/21/20	Fri	14	94 *	102	128	127	92	156	
02/22/20	Sat	15	95 *	102	130	129	92	156	
02/23/20	Sun	16	96 *	103	132	130	91	156	
02/24/20	Mon	17	96 *	103	133	131	91	157	
02/25/20	Tue	18	96 *	103	135	133	91	157	
02/26/20	Wed	19	97	104	137	134	91	157	
02/27/20	Thu	20	98	104	139	135	90	157	
02/28/20	Fri	21	96	105	140	137	90	158	
02/29/20	Sat	22	99	105	142	138	90	158	

Strut Change-Outs

Change-Out	Strut	Overlap Interval		Strut Change	
		First Day	Last Day	From	To
a	1 (Red)	8 (02/15/20)	18 (02/25/20)	7107-0205 Extra-Short Standard	7107-0210 Short Standard
b	2 (Orange)	8 (02/07/20)	1 (02/08/20)	7107-0205 Extra-Short Standard	7107-0210 Short Standard
c	3 (Yellow)	3 (02/14/20)	12 (02/18/20)	7107-0210 Short Standard	7107-0220 Medium Standard



Struts

The frame is adjusted by moving the little metal pin up and down on the strut. This is done by turning the strut following either the + to go up or the – to go down as the number on the prescription tells you.

You need to check that the little metal pin on

the side of the strut that is set on the number on the prescription. You may need to change the strut itself if it is not long or short enough for the prescription to continue.

The prescription for that particular strut that needs to be changed will be highlighted in grey or the colour of the strut if produced in colour.

The team will give you the struts that you need before you go home, or at the clinic, so that you will be able to do this at home. However do not worry if you do not have anyone to help you with this or you are struggling as you can come back to clinic to have this done.

Picture of a strut



Connecting nut to the bottom ring of the TSF

Connecting nut to the top ring of the TSF



Tightening nut

Marking pin for prescription

How to change a strut

1. You will need two size ten spanners and the new strut. You will need to purchase the spanners yourself, which can be bought from hardware stores.
2. Wash your hands.
3. Identify which strut/ struts need changing – it can be more than one and if you follow the prescription from strut one to six it stops you getting confused.
4. Do not loosen the other struts that do not need changing.
5. Attach a spare strut, given to you for strut changes, onto the frame next to any strut. (You will be shown how to do this before a strut change is needed.)
6. With one of the spanners hold the grey top part of the strut that is attached to the black ring and with the other spanner hold the nut that is the other side of the black ring holding the strut in place.
7. Then holding one spanner still, turn the other spanner down to loosen it – remember ‘lefty loosey’ – to loosen turn to the left.
8. Once this screw is loose then repeat the process with the other end of the strut that is attached to the ring below. Continue this until the strut

- comes completely loose and off the frame. Then go back to the top of the same strut to completely unscrew and remove the strut.
9. Do not take the screws out completely in case you forget which hole they have come from, in which case you would not know where to attach the new strut.
 10. Then get your new strut which you have checked with the prescription and do the process in reverse, this time tightening rather than loosening – remember ‘righty tighty’ – turn to the right to tighten. If you have forgotten which hole the strut should go into, you will usually find a white circle around the hole.
 11. Once this is done check that all the struts on the frame are tight and tick the prescription for that day.
 12. Attach the metal or plastic clip with the strut number on it onto the newly changed strut.
 13. Do not forget to remove the extra strut that you put on first to give the frame stability for the strut change.

When you come back to clinic please bring the old struts with you.

Clickers

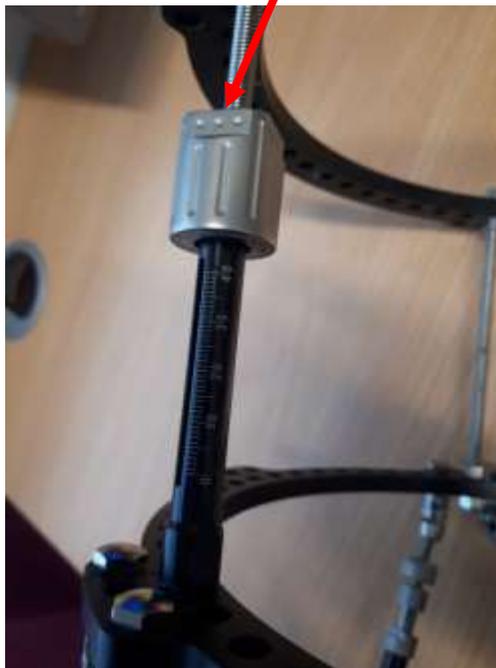
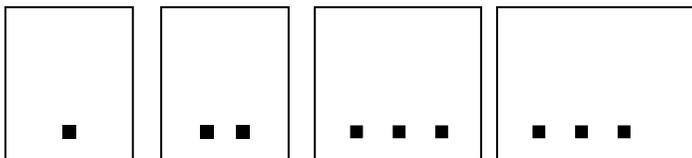
The frames may also have clickers, which are used to grow new bone – bone transport. If this is needed the team will tell you. The clickers normally need to be moved one click (which you can hear and feel) four times a day. You will be asked to turn the clickers following the direction of the dots on the clickers, either upwards or downwards and the team will tell you whether you count the clicks/dots up or down over the day.

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This moves the rings 1mm in total per day – this represents the amount of bone grown in a day.

Dots corresponding to the dots on the clicker

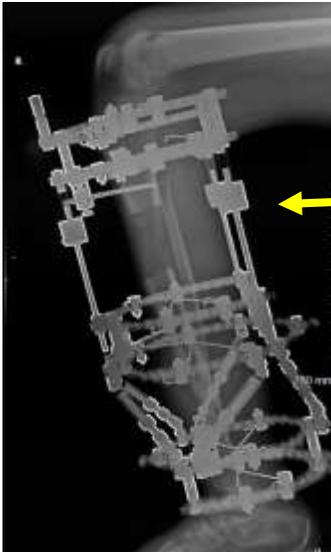


You will also be given a clicker chart and you can either tick or cross out each section each time you move them. This stops you forgetting whether you have done it or not

Normally strut adjustments can be stopped and restarted at any time. Clicker movements cannot be.

The clicker chart

Date	08:00	12:00	16:00	20:00
13/12/2019	X	X	X	X
14/12/2019	X	X	X	X
15/12/2019	X	X		
16/12/2019				



Clicker

This is what the frame looks like on X-ray with clickers on.

Pin site care

This is only for pin sites which are leaking

1. Wash hands with soap and water.
2. Slide plastic clip up the pin, remove the gauze and throw away.
3. You can shower, providing the last stream of water rinses your leg and the frame.
4. If you do not have a shower the pin sites can be cleaned over the bath or using a washing up bowl. With a jug rinse the limb and frame until clean.
5. Then dry with a clean towel, face cloth or hair dryer (if using this use on cool setting otherwise the frame may over heat causing damage to the skin and new bone).
6. Wash hands again.
7. Clean scissors using chlorhexidine (pink spray) or Octenisan before starting pin site care.
8. Clean each pin individually by wiping skin around the pin or wire using chlorhexidine/Octenisan soaked clean gauze or cotton bud. Always wipe away from the pin. Once you have cleaned the skin clean the pin/wire from the skin upwards.
9. It is very important to use clean gauze/ cotton bud for each pin/wire.

10. Do not remove dry skin from the pin site and do not try to mobilise the skin around the pin sites as this will cause irritation and inflammation which can in turn lead to pin site problems.

Trouble shooting

Healthy pin sites:

- look clean
- are not oozing
- are not swollen
- are not red
- are not painful



Healthy pin sites

Irritated pin sites:

- can be painful where skin touches the pin
- red around the pin site
- ooze clear, straw coloured fluid



Infected pin sites:

- very oozy, may have pus coming out of them
- very red
- swollen skin, the limb may also be swollen
- painful to touch



Infected pin sites

Swelling

Swelling of the limb is normal for the first few weeks following surgery. It can also fluctuate with your activity. Sometimes if you have done too much the limb may swell. It is important then to elevate the limb and rest. If the swelling does not settle, please seek advice from your GP.

Cramp

It can be quite common to suffer with cramp. The best way to help settle this is gentle massage to the muscle, where you can, and gentle movement and stretches (see exercise section).

Stiff joints and tight muscles

Due to the location of the frame and the wires and pins you are likely to have restricted movement in the joints above and below the frame, for example your knee and ankle.

You are also at risk of muscle contractures especially in the bottom of the foot, the calf and the back of the knee. It is important to carry out the exercises listed to help with maintenance of range of movement and prevention of muscle contractures. Your physiotherapist will supply you with some stretchy band (theraband) to act as a splint to prevent tightening of your calf muscle.

Life with a fixator

It is important to try to continue with a normal routine to avoid isolation. Look at how you can adapt with the fixator to enable you to continue with your normal life.

Mobility

You will be told by the team how much weight you can put on the limb. It is important if you are allowed to bear weight to start doing this as soon as you are able. The circular frame is stable and designed for weight bearing as this encourages bone healing. It is likely you will need a walking aid initially which your physiotherapist will provide and teach you how

to use. In most cases patients with circular frames can walk on their operated leg as soon as possible. We realise that the limb can be painful but the more weight on the limb the faster it will heal. Therefore, it is important at this stage to take your painkillers regularly.

When getting in/out of bed or attempting to move the limb in bed, if you are unable to use your muscle power, you should lift the limb by the ring of the frame if it is safe to do so. This avoids the pins sliding on the skin.

One of the most important things with a frame is to reduce the risk of foot drop, where the foot drops forward. To try to reduce this it is important to do your exercises regularly and the team will give you a theraband to do this. You may also have a bandage/ splint around your foot that is attached to the frame to bring the foot up.

Sleeping

Sleeping on your back is likely to be the most comfortable position. On your side is also possible with the fixator leg uppermost. A beanbag or pillow can be used to rest the leg as it will offer good support and prevent the leg from rolling. If you share a bed try to sleep on the side that you do not have your fixator on so it is less likely to interrupt

your partner's sleep.

Sitting

Sitting should not be restricted with a frame on the lower leg, but can be difficult with a frame on the thigh. A foam cushion with an area cut out for the frame could be considered for comfort. When sitting, try to elevate the leg as much and as long as possible.

Transport

You will be able to travel in the passenger seat of a car with the seat pushed back and pillow support for comfort.

There is no reason why you would not be able to use public transport. You may just need to plan your journey and consider access to buses or trains.

Negotiating stairs

The golden rules for walking up or down stairs are one step at a time and hold the rail with one hand. If you are going up, step up with your un-operated leg first. To go down, move your crutches first, followed by your operated leg and then the un-operated leg.

You will need to take extra care to avoid catching the frame on the step in front or behind.



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How to go upstairs:

- Hold the hand rail.
- Place your walking aid or aids in the other hand.
- Step up with the un-operated leg first
- Then bring the operated leg and the walking aid up to the same step that the un-operated leg is standing on. Keep repeating the above for each step.

How to come down stairs:

- Hold the hand rail
- Step down with the operated leg and the walking aid.

- Bring the un-operated leg down one step to join the operated leg. You might find it easier to descend the stairs sideways,
- Repeat the above until the bottom of the stairs is reached.

If you are struggling with stairs or you are non-weight bearing, then your physiotherapist will teach you an alternative method or will discuss with you about single-level living.

Clothing adaptations

The frame can be quite bulky so it will require thinking about the clothes you wear. Shorts with wider legs or baggy track suit bottoms can fit over the frame. A tracksuit bottom with zips that come all the way up the leg can be useful. Alternatively cutting the seam of one leg and placing extra material in to make the leg wider or tape to secure the trouser leg can work.

An adapted pillow case with a tie can be useful in the colder months to keep your leg warm.

Footwear can be tricky depending on the location of the wires. Trainers can be comfortable and the long laces can be used to help maintain your foot position when walking by tying them to the frame. If the frame wires sit lower in the ankle a Velcro

sandal or post-operative shoe adapted by your physiotherapist may be more appropriate.

Pain

To help with your treatment, it is important that you have adequate pain relief. Pain levels can vary but can be higher immediately after your operation, when you are starting to weight bear and as you complete frame adjustments. Your doctors and nursing team on the ward will aim to ensure your pain relief is adequate. Please inform someone if you are struggling so alternative medications can be explored, it is not as simple as one medication suits all. If you are suffering high levels of pain, following discharge from hospital, please seek advice from your GP.

Bathing/ showering

The frame can go in the bath/ shower and it is important to do this regularly to keep the limb clean.

Driving

After all surgery you can only drive if you can safely do an emergency stop. You must also tell your insurance company about the injury to ensure that you are still covered.

Working

Obviously this will depend upon the job that you do, but in time it may be possible to go back to work. Sometimes some adaptations are required.

If you require a sick certificate you can get it from your GP or ask at your clinic appointment.

Flying

If you are planning to travel by plane, this should be discussed with the medical team, as there is the possibility of developing blood clots in the limbs or lungs. You may be offered blood thinning injections to try to reduce the risk.

You must also inform your travel insurance company and the airline.

You may set off the airport scanners.

Try to keep your limb elevated as much as possible as it will swell.

Anti- coagulation

You normally have injections in your tummy (Dalteparin) after your operation. The length of time you have them for will depend upon whether or not you can take weight through your limb.

Smoking

Smoking slows down bone and soft tissue healing. If you continue to smoke your recovery will take longer and may cause complications with the healing process. We can help you to stop smoking so please discuss this with the team.

Loose wires/pins

Occasionally there can be loss of tension or a wire may snap. This is not an emergency, but you should contact Clinic 1 to speak to one of the nurses who will advise you on what you need to do.

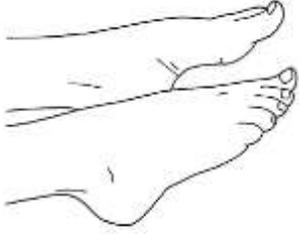
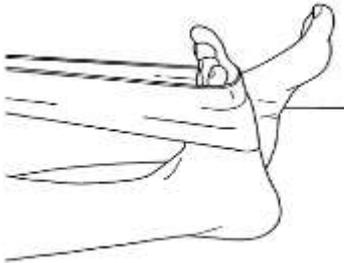
Psychological effects

It is very normal to have times of low mood, frustration and to sometimes feel tearful. If you would like some support with this talk to your GP for some help and advice.

There are also support groups both locally and on line where you can talk to others who have been through, or are still going through similar situations.

External fixator wearers support Group:
www.ilizarov.org.uk

Physiotherapy exercises

 <p>©PhysioTools Ltd</p>	<p>This exercise is for your circulation. Lying or sitting with your back supported, bend and straighten your ankles as quickly as you can. This may be restricted by the position of your frame, if this is the case just try to wriggle the toes</p>
 <p>©PhysioTools Ltd</p>	<p>This exercise is to help prevent calf tightness. Use a scarf/tie or piece of material to loop over the ball of your foot and gently pull up. Hold for 20 to 30 seconds and repeat three times. This exercise should be completed hourly during the day.</p>
 <p>©PhysioTools Ltd</p>	<p>Lie in a comfortable position. Tighten your thigh muscles by pushing your knee down on to the bed and pulling your toes up towards you, keeping your knee straight. Hold for five seconds then repeat x 10.</p>



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Lie in a comfortable position. Bend your knee up towards you, keeping your heel close to the bed. Lower slowly.

Repeat x 10



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Lie in a comfortable position. Aim to lift the leg keeping it straight. Lift approximately five inches.

Repeat x 10



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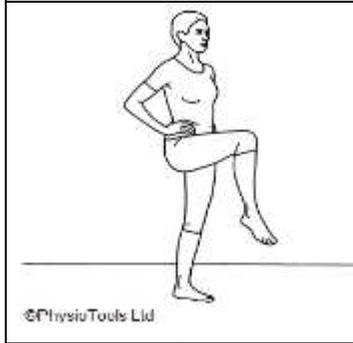
Whilst sitting on a chair with your thigh fully supported, tighten your thigh muscle and raise your foot until the leg is fully straight. Lower slowly.

Do not lift your knee higher than your hip.

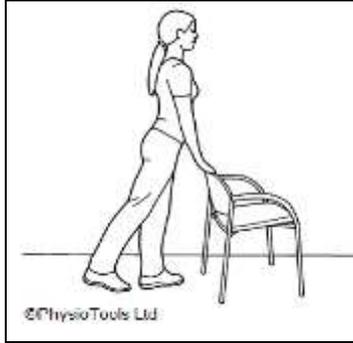
Repeat x 10



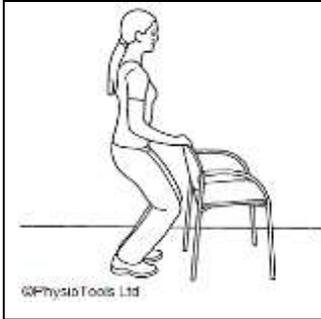
Standing in an upright position with your upper body still; hold onto something fixed for balance. Move your weak leg sideways away from your body and then back to the centre. Move in a controlled manner keeping your kneecap and toes facing forwards.
X 10



Standing in the same position as for the above exercise holding on with one hand. Move your weak leg forwards and upwards bending at both the hip and the knee towards a 90° angle. Slowly lower the leg to the ground.
Repeat x 10



Standing in the same position as the previous two exercises. Keeping your knee straight move your leg directly backwards as far as comfortably possible and then back to the starting position. Keep your upper body still throughout.
Repeat x10



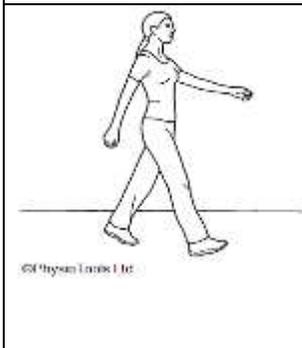
Standing in front of a surface for support. Gently squat down as far as you are comfortable. Keep your weight equal across both feet.

Repeat x 10



On an exercise step or the first step of your stairs, step up leading with your strongest leg leading to start. Then repeat with the operated leg if able.

Repeat x 10



Increase your walking gradually each day, initially this will be with walking aids but you may manage without later on in your recovery.

If any of the exercises in this book cause you sharp pain, stop that exercise immediately and ask your physiotherapist for further advice but please continue with all the other exercises.

Frame removal

Once the frame has been removed you are likely to have stiffness in your joints and tightness in the muscles. It would be beneficial to have some further physiotherapy as an outpatient at this time, to help with movement and strength.

Follow- up

You will have regular out- patient appointments.

You will often go

for an x-ray prior to seeing the team, so please ensure that you attend the appointment on time and let the clinic know if you are unable to attend.

If your frame prescription runs out before your next clinic appointment, do not worry you will be given another prescription after your X-ray at the next appointment if you still need one.

Further Information

www.limbreconstructions.com

Contacts

Clinic 1 Addenbrooke's Hospital: 01223 257094

Ward C8: 01223 217279

Ward D8: 01223 217282

Inpatient physiotherapy team: 01223 216104/216989

Images:

www.limbreconstructions.com

www.aboutkidshealth.com

Document history

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