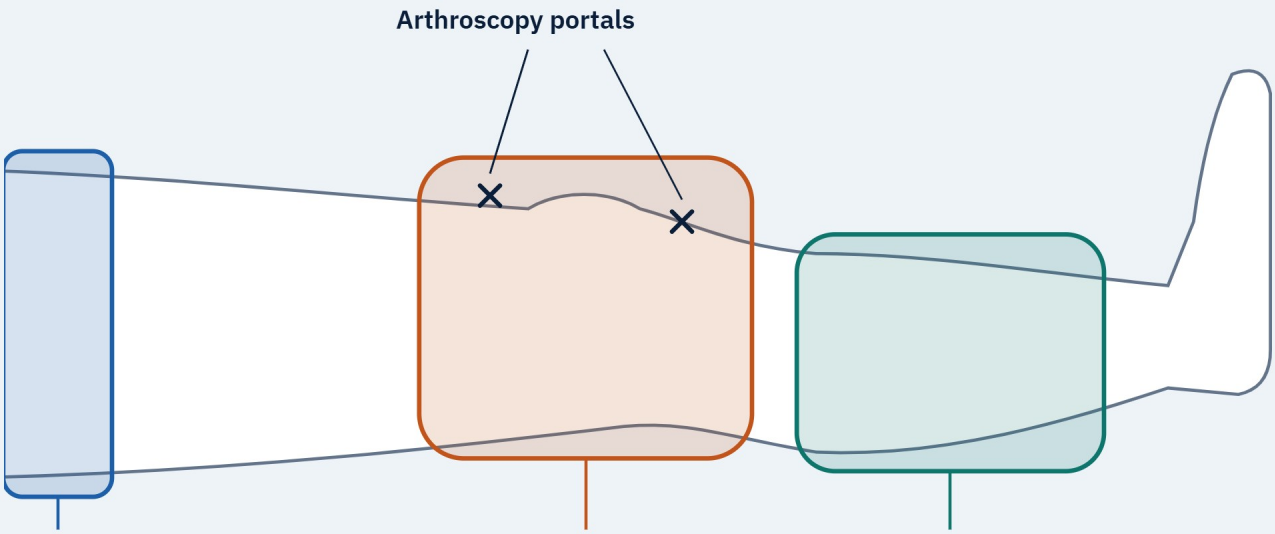
# Post-Arthroscopy Equipment

## A Clinical Guide

What to prescribe, on which postoperative day, how to use each device, and where every cuff sits relative to the wound.




### WHEN EACH DEVICE STARTS

| | | | |
|---|---|---|---|
| **POD 0**<br>Cold or cold-compression cuff | **POD 0**<br>Crutches or walking frame | **POD 0**<br>Brace or sling after repairs | **POD 0**<br>Stockings or IPC, if at risk |
| **POD 0–1**<br>CPM for cartilage and hip | **POD 1**<br>NMES for the quadriceps | **POD 1–3+**<br>BFR cuff; most trials from week 2 | **6 joints**<br>Knee, shoulder, hip, ankle, elbow, wrist |

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# Post-Arthroscopy Equipment: A Clinical Guide

## Introduction and scope

Most patients leave arthroscopy with two things prescribed on the day of surgery (postoperative day 0, POD 0): a cold or cold-compression device and, after lower-limb surgery, a walking aid. Braces and slings are added after repair or reconstruction. Continuous passive motion (CPM), electrical stimulation, blood flow restriction (BFR) cuffs and venous thromboembolism (VTE) devices are reserved for specific procedures or risk profiles.

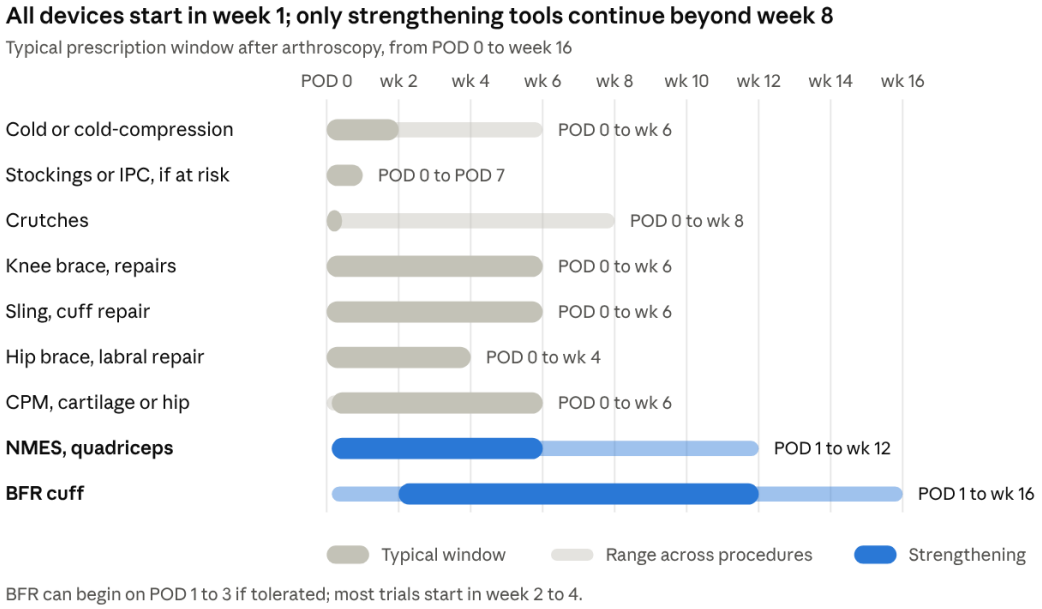
This guide covers knee, shoulder, hip, ankle, elbow and wrist arthroscopy. For each device it gives the indication, the POD on which it starts and stops, how the patient uses it, and where any cuff sits relative to the incisions. Outcome figures come from the randomised trials, meta-analyses and guidelines listed under References.

Three conventions apply throughout:

- **POD 0** is the day of surgery; "week 2" means POD 8 to 14.
- **Surgeon's protocol first.** Timings here are typical ranges from published protocols; the operating surgeon's instructions and the device's instructions for use (IFU) take precedence.
- **"Distal" and "proximal"** are relative to the operated joint, and distances are measured from the nearest incision or portal edge.

## At a glance: when each device is used

Every device on this list is prescribed in the first postoperative week, most on POD 0. Protective devices stop by week 6–8; quadriceps strengthening with NMES and BFR runs to week 12–16.




compiled from the trials and protocols cited in this guide · 9 devices, POD 0 to week 16

Dark bars show the usual window; light bars show the spread from simple debridement to repair or cartilage surgery. The procedure tables later in this guide give the exact start and stop day for each operation.

## Cryotherapy and cold-compression cuffs

Cold therapy starts in the recovery room on POD 0 and is the one device almost every arthroscopy patient receives. The cuff is centred directly over the operated joint, on top of a light dressing; it is neither proximal nor distal to the wound, it covers it. Its proven benefit is less early pain and, with compression, less opioid use; it does not improve range of motion or drainage.

### Device options

| Device | What it delivers | Typical schedule | Usual duration |
|---|---|---|---|
| Ice or gel pack in a wrap | Cold only | 20 min on, at least 1 h off | POD 0 to about week 2 |
| Gravity-fed cold-compression cuff (e.g. Aircast Cryo/Cuff) | Cold plus static focal compression | Cuff re-chilled when it warms; cooling lasts about 20 min per fill (McKesson) | POD 0 to week 1–2; longer after reconstruction |
| Motorised continuous-flow cooler | Continuous circulating cold water | Per device IFU | POD 0 to week 1–2 |
| Cold with dynamic intermittent compression (e.g. Game Ready) | Cold plus cyclic pneumatic compression | 30 min, 3 times a day in the main ACL trial | Up to 6 weeks after ACL reconstruction |

### When to start and stop

- **POD 0:** apply in recovery once the dressing is on and any nerve block has been checked; skin sensation may be absent under a block, so skin checks matter most here.
- **POD 1–14:** use regularly, especially after physiotherapy and before sleep. A UK hospital leaflet advises no more than 20 minutes at a time with a 1-hour break between sessions (Sherwood Forest Hospitals NHS).
- **Weeks 2–6:** continue after ACL reconstruction, cartilage or rotator cuff repair while swelling persists; stop after simple debridement or meniscectomy once swelling settles.

### How to apply a gravity-fed knee cuff

Steps follow the manufacturer's patient instructions (Enovis/DJO Knee Cryo/Cuff Gravity) unless marked otherwise.

1. Prepare the cooler: connect the tube, add cold water to the fill line, add ice to its line, lay the insulation disk on top and close the lid. Shake occasionally for 5 minutes to chill the water.
2. Position the patient lying or reclined with the leg straight and elevated (NHS leaflet).
3. Check the dressing: it must be light, and no elastic wrap is used under the cuff.
4. Apply the cuff **empty**. Centre it over the knee with the central hole over the kneecap; fasten the top strap snugly, the bottom strap loosely, then adjust the front strap.
5. Connect the tube, open the cooler's air vent and raise the cooler until the cuff fills. Never raise it more than 38 cm (15 in) above the cuff, which would over-pressurise it. Close the vent and disconnect if the patient will move.
6. To re-chill, drain the cuff completely while still attached to the cooler, then refill.
7. Check the skin every 1–2 hours; reduce pressure at any discomfort, numbness or tingling.

Sizing uses thigh circumference measured 15 cm (6 in) above the patella (product listing).

**Placement by joint**

| Joint | Cuff position | Relation to portals |
|---|---|---|
| Knee | Wrapped around the knee, opening over the patella | Covers anterior and any posterior portals, through the dressing |
| Shoulder | Over the acromion and deltoid, strap across the chest | Covers posterior, lateral and anterior portals |
| Hip | Over the greater trochanter and anterolateral thigh | Covers anterolateral and mid-anterior portals |
| Ankle | Around the ankle, heel free or enclosed per model | Covers anteromedial and anterolateral portals |
| Elbow, wrist | Around the joint over the splint padding | Covers portals through padding |




*Photo 1. Cold-compression wrap centred on the knee and strapped evenly from thigh to shin. The dressing and incisions lie under the wrap, which is how it should be: the cold cuff covers the wound through the dressing. Shown after knee replacement; placement after arthroscopy is the same.* Source: Arthroplasty 2025, Fig. 2, CC BY 4.0; cropped and labelled.

### Outcomes

- **ACL reconstruction, cold vs no cold:** a meta-analysis of 7 randomised trials found significantly less pain with cryotherapy ($p = 0.02$) but no difference in drainage ($p = 0.23$) or range of motion ($p = 0.25$) (Raynor 2005).
- **ACL reconstruction, cold compression vs none:** a systematic review of 10 trials (573 patients) found significantly lower pain 48 hours after surgery and no difference in adverse events (Martimbianco 2014).
- **ACL reconstruction, cold compression vs ice packs:** in a 36-patient RCT, 83% of the cold-compression group had stopped narcotics by 6 weeks, against 28% with ice ($p = 0.0008$) (Waterman 2012; figures as reported in the abstract).
- **Knee arthroscopy overall:** a meta-analysis found cryotherapy reduced opioid consumption and pain at 24 hours compared with placebo (Gazendam 2021).
- **Shoulder arthroscopy:** in an RCT of rotator cuff repair or subacromial decompression (46 analysed), compressive cryotherapy did not beat a standard ice wrap for pain or morphine-equivalent dose over the first week (Kraeutler 2015). A 2025 review of non-knee joints called shoulder evidence inconsistent, with compression plus cold performing best (PMC review).

### Precautions

Avoid or use with specialist advice in cold urticaria or allergy, Raynaud's phenomenon, peripheral vascular disease, and reduced skin sensation such as diabetic neuropathy. Never place a cold device on bare skin, and never let the patient sleep with an unregulated ice pack in place.

## Blood flow restriction (BFR) cuffs

The BFR cuff is the only post-arthroscopy cuff placed away from the operated joint: always at the most proximal part of the limb, inflated only during exercise, and never over an incision. After arthroscopy it can start as early as POD 1–3 if the cuff is tolerated, though most trials begin in week 2 to 4. It lets patients build strength with 20–40% of their one-repetition maximum (1RM) instead of the heavy loads a healing graft or repair cannot take.

### Indications and timing

| Procedure | Typical BFR start | Notes |
|---|---|---|
| ACL reconstruction | POD 1–3 at the earliest; trials mostly week 2–4 | Quadriceps atrophy is the main target |
| Meniscectomy, debridement | Week 1–2 | Shorter programmes, 4–6 weeks |
| Meniscal or cartilage repair | Within days, while non-weight-bearing | Open-chain and isometric work only |
| Rotator cuff repair | Under trial; cuff on the proximal arm | Exercises limited by the repair protocol |
| Hip arthroscopy | Under trial; cuff on the proximal thigh | Check clearance from hip portals |

A hospital BFR protocol allows starting 1–3 days after arthroscopic surgery such as ACL reconstruction because incisions are small; open surgery waits 2–3 weeks or until sutures are out (Sanford Health guideline).

**Placement and distance from the wound**

- **Lower limb:** at the top of the thigh, as close to the groin as possible but below the gluteal fold (Weatherholt 2019). This is proximal to knee and ankle portals.
- **Upper limb:** at the top of the arm, just below the axilla (S-TRONGER trial protocol). This is distal to shoulder portals and proximal to elbow and wrist portals.
- **Hip arthroscopy:** one RCT places the cuff on the proximal thigh just below the greater trochanter (NCT04113759), which puts it close to the portals; confirm the upper edge clears every dressing.
- **Distance:** no guideline sets a minimum distance in centimetres. Placement is defined by landmark ("as proximal as possible"), and the cuff and its sleeve must not touch any incision, portal, drain or graft-harvest site.
- **Knee in practice:** with a cuff at the groin, its lower edge typically sits about 20–30 cm above the knee portals in an average adult. This is an anatomical estimate, not a guideline value.

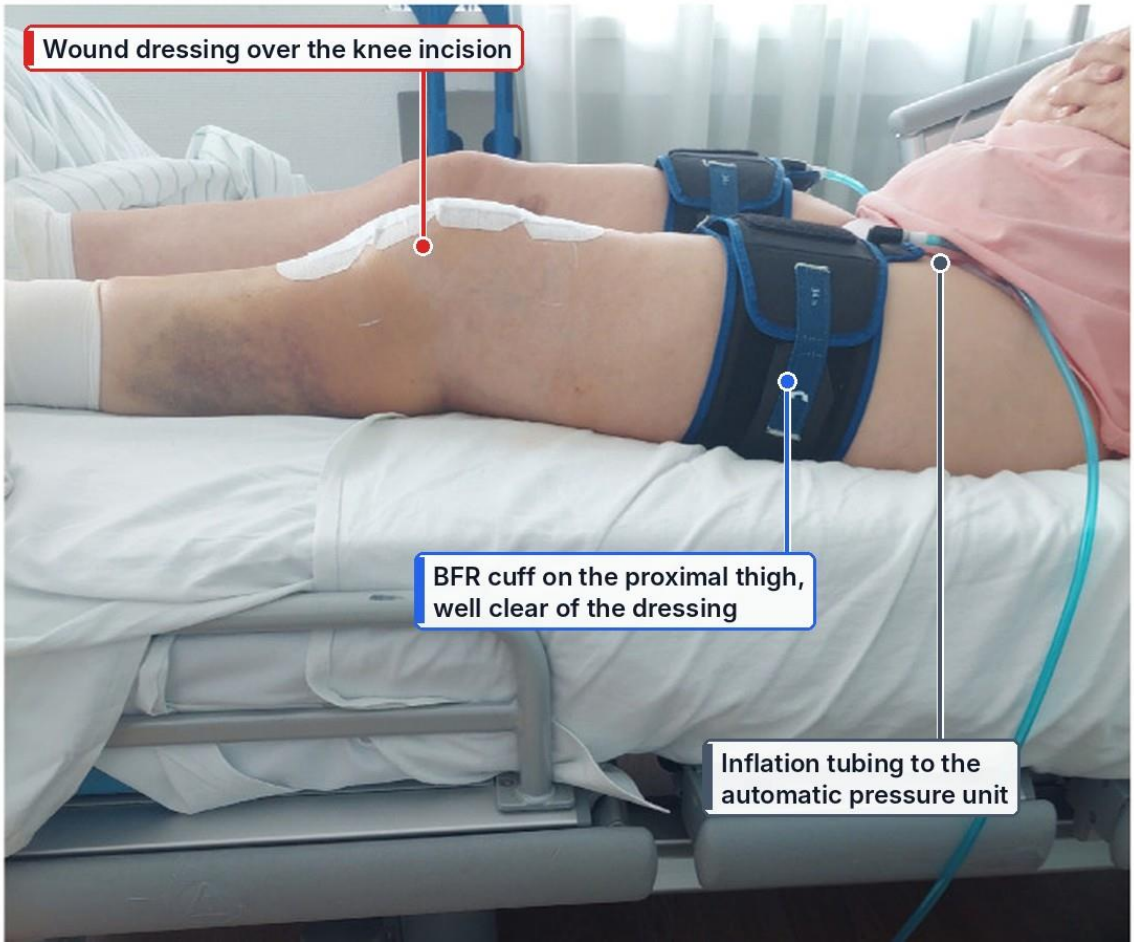



*Photo 2. BFR cuff on the proximal thigh of the operated leg, with the knee wound dressing in full view and clear of the cuff edge. Taken during passive BFR in hospital after knee replacement; after arthroscopy the portals are smaller and the gap larger.* Source: J Clin Med 2025;14:5218, Fig. 1, CC BY 4.0; cropped and labelled.

### Dose

| Parameter | Recommendation | Source |
|---|---|---|
| Pressure | 40–80% of arterial occlusion pressure; one protocol uses 80% for the leg, 50% for the arm | Patterson 2019 position stand; Sanford |
| Load | 20–40% 1RM | Patterson 2019 |
| Sets and repetitions | 75 repetitions as 30, 15, 15, 15 | Patterson 2019 |
| Rest between sets | 30–60 s, cuff kept inflated | Patterson 2019 |
| Restriction time | 5–10 min per exercise, cuff deflated between exercises | Patterson 2019 |
| Frequency | 2–3 sessions a week; 1–2 a day for short 1–3 week blocks | Patterson 2019 |
| Passive BFR (no exercise possible) | 5 min inflated, 3–5 min deflated, 3–5 cycles, 1–2 times a day | Patterson 2019 |

### How to apply

1. Screen for contraindications (see Precautions) and check the wound.
2. Lie the patient supine and pull a limb protection sleeve onto the proximal limb; thick clothing is not an acceptable barrier.
3. Wrap the cuff snugly at the most proximal point, then confirm no edge sits on a dressing or incision.
4. Measure limb occlusion pressure (LOP) supine, with the device's sensor or a Doppler probe distal to the cuff.
5. Set the training pressure as a percentage of LOP. If poorly tolerated, start lower and build up.
6. Run the exercises, keeping the cuff inflated through each exercise's sets and deflating between exercises.
7. Remove the cuff as soon as the session ends, and re-measure LOP at every new session.

### Outcomes

- **ACL reconstruction, BFR vs heavy-load training:** in a 28-patient NHS RCT (24 completed), BFR at 30% 1RM matched heavy-load training at 70% 1RM for strength (10RM up 104% vs 106%). It gave greater reductions in knee pain (67% vs 39%) and effusion, and larger range-of-motion gains (78% vs 48%), with no adverse events (Hughes 2019).
- **Knee arthroscopy, non-reconstructive:** a pilot RCT (17 completed) found BFR effective, and duplex ultrasound showed no thrombosis after 12 sessions (Tennent 2017; Patterson 2019).
- **Partial meniscectomy:** in a 40-patient RCT, adding BFR improved quadriceps strength and thickness more than routine rehabilitation (Ke 2022).
- **A negative trial:** in 30 ACL patients starting at week 4, BFR added to low-load leg press gave no short-term benefit in pain, strength, motion or function (Barzyk 2026; ReachMD summary).
- **Safety:** a Japanese survey of 12,642 people reported venous thrombus in 0.055%, pulmonary embolism in 0.008% and rhabdomyolysis in 0.008% (Nakajima 2006).

### Precautions

One hospital protocol lists these contraindications and precautions: unstable or severe hypertension, sickle cell anaemia, prior venous thromboembolism, intravenous drug use in the limb, lymphoedema, active cancer, compromised circulation and a limb that has had lymph node dissection (Sanford).

## VTE prophylaxis devices: stockings and pneumatic compression

Routine VTE prophylaxis is not needed after most arthroscopy, because symptomatic clots are rare: about 0.4% after knee, 0.2% after shoulder and under 1% after hip arthroscopy. Devices are prescribed after an individual risk assessment, typically for long procedures, prior VTE, cancer, hormonal contraception or restricted weight-bearing. When used, compression sits distal to or over the operated joint, never proximal to it like a BFR cuff.

### How often clots occur

| Procedure | Symptomatic VTE | Source |
|---|---|---|
| Knee arthroscopy, no prophylaxis | 0.2% at 7 days, 0.3% at 14 days, 0.4% at 35 days; all within 6 weeks | Olmsted County cohort, 4,833 patients |
| Knee arthroscopy, LMWH vs none (POT-KAST RCT) | 0.7% with LMWH vs 0.4% without (RR 1.6, 95% CI 0.4–6.8) | van Adrichem 2017, NEJM |
| Shoulder arthroscopy | DVT 0.15%, PE 0.08%, all VTE 0.21% (32,407 patients) | Triplet 2022 |
| Hip arthroscopy | Pooled VTE 0.656% (135,377 patients; range 0–6.94%) | Gao 2025 |

### What the guidelines say

- **ACCP 2012:** for knee arthroscopy without a history of VTE, no thromboprophylaxis is suggested (Grade 2B) (PulmCCM summary).
- **NICE NG89:** prophylaxis after arthroscopic knee surgery when anaesthetic time is 90 minutes or more, or when VTE risk outweighs bleeding risk (audit quoting NG89). If stockings are unsuitable, intermittent pneumatic compression is the alternative (NICE NG89).
- **Cochrane 2022:** no clear evidence that LMWH, aspirin or rivaroxaban reduces the small clot risk in healthy adults having knee arthroscopy (Perrotta 2022).

### Graduated compression (anti-embolism) stockings

**When:** fitted before or at the end of surgery on POD 0, then worn day and night until the patient is no longer significantly less mobile than usual (NICE via GPnotebook). In the KANT trial they were worn for 7 days.

**Placement:** knee-length stockings end below the knee, distal to knee portals. Thigh-length stockings pass over the knee dressing, so NICE advises caution and clinical judgement when applying stockings over wounds.

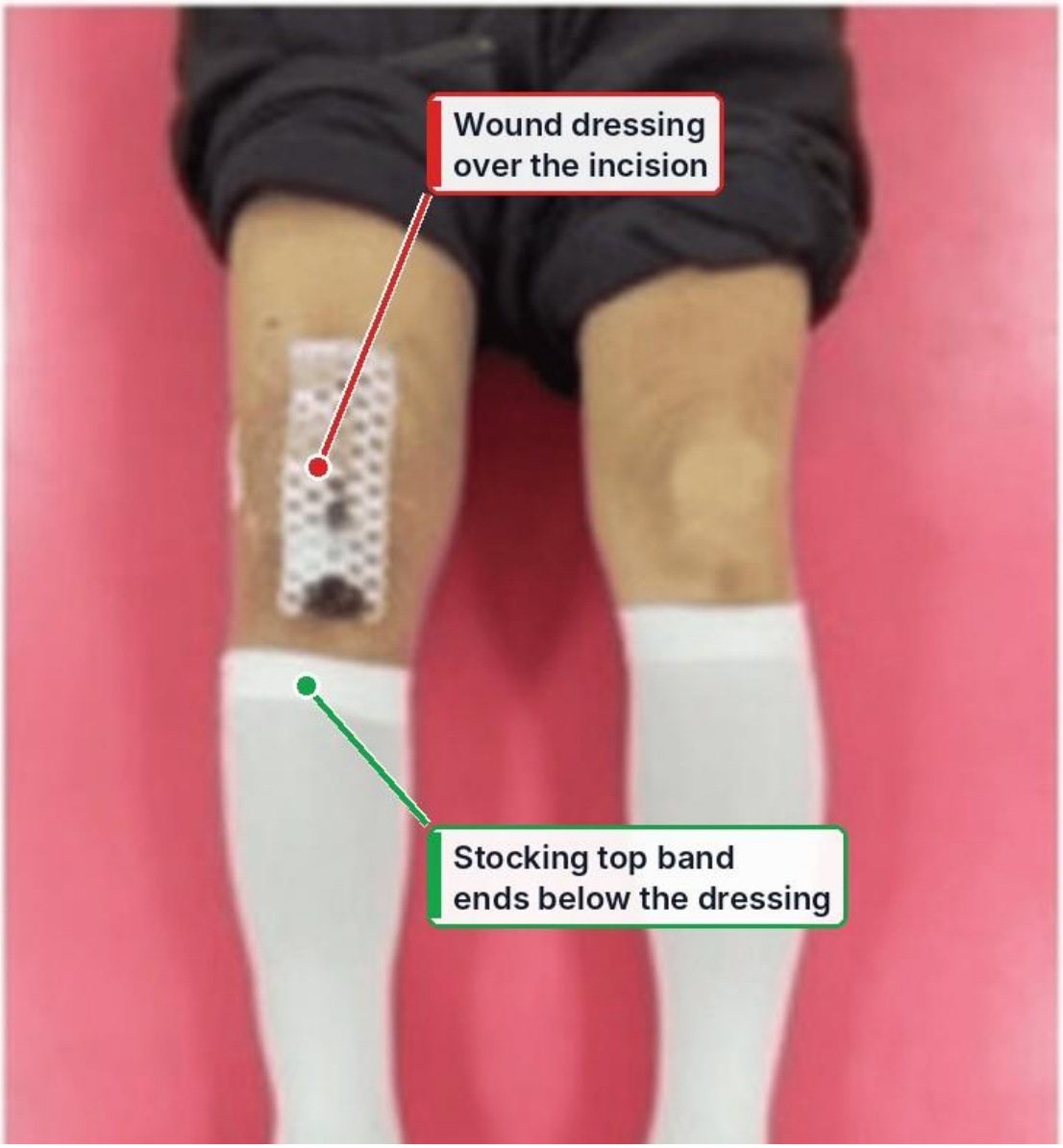



*Photo 3. Knee-length anti-embolism stockings with the top band ending below the knee dressing, which stays visible and free of compression. Shown after knee replacement.* Source: Cureus 2025, Fig. 3, control group, CC BY 4.0; cropped and labelled.

**How to fit:**

1. Measure the legs and supply the size the manufacturer's chart gives; anti-embolism stockings should give graduated compression with a calf pressure of 14–15 mmHg.
2. Turn the stocking inside out to the heel, ease it over the foot and heel, then roll it up the leg without folds or a turned-down top band.
3. Check the heel pocket sits on the heel and the inspection hole under the toes.
4. Remove daily for washing and skin inspection; inspect 2–3 times a day if mobility, skin or sensation is poor.
5. Re-measure and refit if the leg swells after surgery.
6. Stop if marks, blisters, discolouration or pain appear, and offer a foot impulse or IPC device instead.

**Do not fit** in suspected or proven peripheral arterial disease, after arterial bypass grafting, in peripheral neuropathy, severe leg oedema or heart failure, fragile skin or dermatitis, or with leg shapes that prevent correct fit (NICE via GPnotebook).

### Intermittent pneumatic compression (IPC)

**When:** applied in theatre on POD 0, especially in the beach-chair position for shoulder surgery or long lower-limb cases, and continued until the patient walks regularly.

**Placement:** foot or calf sleeves. After knee arthroscopy, a calf sleeve on the operated leg must end below the knee dressing; a thigh-length sleeve would cover the portals and is generally avoided on that side. The non-operated leg can take any length.

**Use:** wrap the sleeve snugly, enough to fit two fingers beneath it, connect it to the pump and confirm the cycle runs. Do not use IPC in a patient allergic to its material.

### Outcomes

In the KANT trial of 1,761 knee arthroscopy patients, full-length stockings for 7 days gave a 3.2% rate of asymptomatic proximal DVT, symptomatic VTE or death. Seven days of LMWH gave 0.9% ($p = 0.005$), with more bleeding: 0.9% vs 0.3% (Camporese 2008; Hospitalist summary). Almost half the events were distal DVTs of uncertain importance.

Early walking and ankle pumps every hour while awake remain the default prophylaxis for low-risk patients.

## Mobility aids: crutches and walking frames

Every lower-limb arthroscopy patient leaves on POD 0 with crutches, fitted and gait-trained before discharge. How long they stay depends on the weight-bearing order: a few days after meniscectomy, 3 weeks after hip labral repair, 6–8 weeks after microfracture. A walking frame replaces crutches for patients whose balance or upper-body strength cannot manage them.

### Fitting axillary crutches

1. Fit with the patient standing upright in the shoes they will wear.
2. Set the top pad 1–2 inches (2.5–5 cm) below the armpit (AAOS OrthoInfo).
3. Set the handgrips level with the top of the hip line, so the elbows bend slightly, about 15–30°.
4. Teach the patient to carry weight through the hands, not the armpits: pressure on the pad can compress the nerves of the axilla.
5. Keep the crutch tips about 4 inches (10 cm) out from the feet (Columbus Hospital, citing AAOS).

For a walking frame, the handgrips sit at the crease of the wrist with the arms relaxed (OCC Ortho).

### Weight-bearing orders and gait

| Order | What the patient does | Typical arthroscopic indications |
|---|---|---|
| Non-weight-bearing (NWB) | Operated foot never touches the floor; three-point gait | Complex meniscal repair, first 6 weeks in one protocol; early cartilage repair |
| Touch-down or foot-flat (about 20 lb, 9 kg) | Foot rests flat for balance only | Hip labral repair, about 3 weeks; femoral or tibial microfracture, 6–8 weeks |
| Partial (PWB, % of body weight) | Weight checked on bathroom scales, progressed in steps | Meniscal root repair, e.g. 25% at week 5 to full at week 8–9 |
| As tolerated (WBAT) | Crutches discarded once gait is normal | Meniscectomy, debridement, ACL reconstruction, standard meniscal repair in a locked brace |

Sources: Sanford complex meniscal repair guideline; hip labral repair protocol; Steadman-based microfracture protocol; Altru meniscal root protocol.

Early weight-bearing after ACL reconstruction has shown no adverse effects in randomised trials (Kruse 2012 review).

### Gait patterns to teach

- **Three-point (NWB, touch-down):** move both crutches forward, bring the operated leg level with them, then step the good leg through.
- **Partial or as tolerated:** crutches and operated leg move together, then the good leg follows.
- **After hip arthroscopy:** use a step-to pattern so the hip never extends beyond neutral in the early weeks (Allina hip protocol).
- **Stairs:** up with the good leg first, then the operated leg and crutches; down with crutches and operated leg first. With a handrail, hold it with one hand and carry both crutches under the other arm (AAOS).
- **Weaning:** two crutches, then one crutch held in the hand opposite the operated side, then none once the gait is pain-free and without a limp.

## Braces, immobilisers and slings

Braces and slings are fitted in theatre or recovery on POD 0, and only where something has been repaired. After meniscectomy and debridement they are unnecessary; after ACL reconstruction, randomised trials show no advantage. After meniscal, cartilage, rotator cuff and labral repair they protect the repair for 2–8 weeks.

### Knee

| Procedure | Brace and setting | Duration |
|---|---|---|
| Meniscectomy, debridement | None | — |
| ACL reconstruction | Optional; 11 trials found no advantage to post-operative bracing (Kruse 2012) | Surgeon preference |
| Meniscal repair, standard | Hinged brace locked in full extension for walking; weight-bearing allowed in the locked brace; opened to 0–90° from week 4 | Discharged at week 6 (Sanford) |
| Meniscal repair, complex | Locked in extension at all times except range-of-motion work; non-weight-bearing for 6 weeks | 6–8 weeks (Sanford) |
| Patellofemoral microfracture | Hinged brace with a 0–20° flexion stop for at least 8 weeks, removed only for CPM | Opened gradually; stopped by about 12 weeks (protocol) |

**How to fit a hinged post-operative knee brace**

1. Lie or sit the patient with the leg fully straight and the brace opened flat with all straps undone.
2. Slide the brace under the leg and centre the hinges on the top of the kneecap (Breg IFU). Another maker specifies the upper third of the patella and notes that too high is better than too low (Thuasne).
3. Fasten the straps nearest the knee first, then the outer ones (Breg post-op knee IFU).
4. Check that the hinges sit at the sides of the knee, not in front of it, and that no strap or pad presses on a portal or the dressing.
5. Set the extension and flexion stops exactly to the protocol, and lock the hinge if ordered.
6. Re-check fit after a few steps and as swelling changes; re-tension the straps in the same order.




*Photo 4. Post-operative knee immobiliser with the patella window centred on the kneecap and straps above and below the knee. This is a demonstration on a volunteer, so there is no dressing; after surgery the portals sit under the window area and no strap may cross them.* Source: Knieschiene 02 by Frank C. Müller, CC BY-SA 4.0; labelled, and this adapted image is shared under the same licence.

### Shoulder

| Procedure | Device | Duration |
|---|---|---|
| Subacromial decompression, debridement | Simple sling for comfort | A few days |
| Rotator cuff repair, small to medium tear | Sling, with or without abduction pillow | 0–6 weeks; early-motion protocols allow self-weaning |
| Rotator cuff repair, large or massive tear | Sling with abduction pillow | Typically the full 6 weeks |
| Labral (Bankart or SLAP) repair | Sling | Typically 3–6 weeks, per surgeon |

**How to fit a shoulder sling:** support the forearm to the wrist with the elbow at about 90° and the hand level with or slightly above the elbow. Pad the neck strap. With an abduction pillow, the pillow sits against the waist so the arm rests slightly away from the body.




*Photo 5. Abduction sling after shoulder surgery, front and side views: forearm supported to the wrist, elbow near 90°, arm held slightly away from the body by the cushion. The shoulder dressing is under the shirt here; check it for strap pressure at every visit. Shown after shoulder replacement; the sling is fitted the same way after arthroscopic cuff repair.* Source: J Clin Med 2024;13:6363, Fig. 2, CC BY 4.0; cropped below the face and labelled.

**Evidence on sling time after rotator cuff repair:**

- In an RCT of 206 patients, early mobilisation (self-weaning from the sling, pain-free active motion) gave better flexion and abduction at 6 weeks than 6 weeks in a sling, with no other differences to 24 months (Sheps 2019).
- In 80 patients with tears of 3 cm or less, going without a sling gave lower pain at 6 months (0.8 vs 1.5) with no difference in repair integrity on ultrasound (Tirefort 2019).
- Pooled level 1 data showed no difference in retear between early and delayed passive motion (13.7% vs 10.5%). For tears of 5 cm or more, though, early motion carried a higher retear risk (52.2% vs 22.6%) (Kluczynski 2015).

### Hip

After hip arthroscopy with labral repair, a hip brace is set at 0° extension to 90° flexion for walking and locked at 0° for sleep. It is worn whenever the patient is up and removed for CPM (Van Thiel protocol). Weaning typically begins at about 4 weeks, once the gait is pain-free and non-compensatory (OrthoIllinois protocol).

## Continuous passive motion (CPM)

CPM is started on POD 0–1 after cartilage repair and many hip arthroscopies, and sometimes after rotator cuff repair; it has no place after routine ACL reconstruction or meniscectomy. The usual cartilage prescription is 6–8 hours a day for about 6 weeks, starting at 0–30° at one cycle per minute.

### Indications and settings

| Procedure | Start | Range and speed | Daily dose and duration | Evidence |
|---|---|---|---|---|
| Knee cartilage repair (microfracture, ACI, osteochondral graft) | POD 1 most commonly | 0–30° initially, 1 cycle/min, increased as tolerated | 6–8 h/day for 6 weeks | Most common regimen across 107 studies (Fazalare 2013 review); clinical benefit not proven |
| Patellofemoral microfracture | Immediately after surgery | 0–40°, 1 cycle/min | 6–8 h/day for 6–8 weeks | Steadman-based protocol (protocol) |
| Hip arthroscopy, labral repair or debridement | POD 0–1 | Week 1 10–45°, week 2 0–60°, week 3 0–70°, then 0–80° | 4–6 h/day for 3–6 weeks; up to 6 weeks after microfracture | Settings: Arthrosc Sports Med Rehabil 2022; dose: BayCare protocol |
| Rotator cuff repair | POD 1 | Within the protocol's passive limits | 2 h/day for 4 weeks in the main RCT | Mixed; see below |
| ACL reconstruction | Not indicated | — | — | 6 trials, no advantage (Kruse 2012) |

### How to set up a knee CPM machine

1. Place the machine on the bed and adjust its thigh length so the machine's hinge lines up with the knee joint.
2. Adjust the foot plate so the foot rests in neutral, with no pressure on the heel.
3. Fasten the straps over the thigh and shin snugly, clear of the portals and dressing.
4. Set the extension and flexion limits and the speed exactly to the protocol; start a cycle and watch the first few to check alignment and comfort.
5. Use in blocks of 1–2 hours to reach the daily total, and remove the brace for CPM but refit it for walking.
6. Stop and contact the team if wound drainage increases, the calf becomes painful or swollen, or pain climbs steadily.

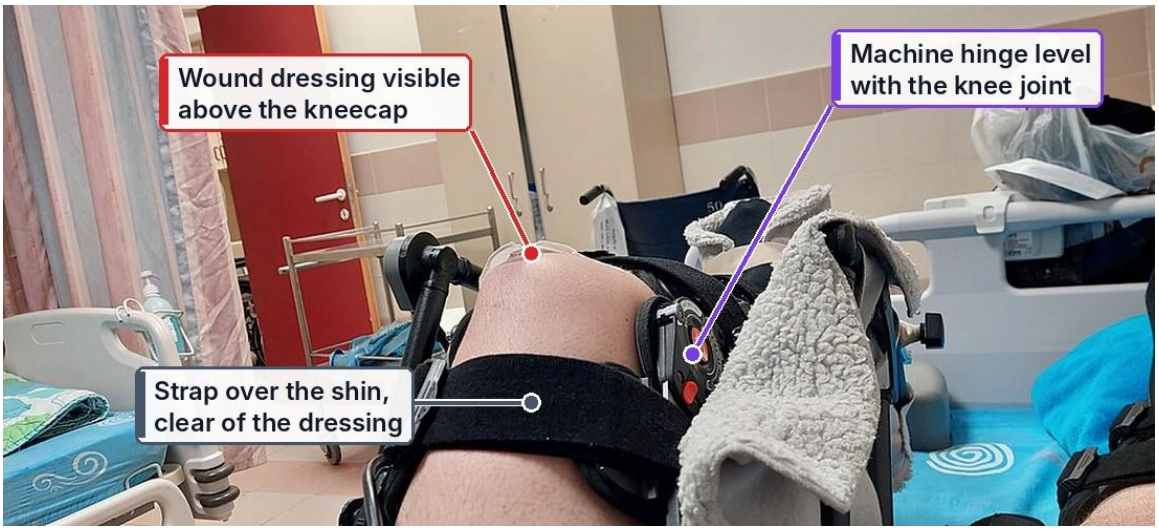



*Photo 6. Knee CPM machine in hospital after knee surgery, seen from the patient's position. The dressing above the kneecap is visible and uncovered, the shin strap sits below it, and the machine's hinge is level with the knee.* Source: CPM KNEE A by Assayas, CC BY-SA 4.0; labelled, and this adapted image is shared under the same licence.

After hip arthroscopy, the same knee machine is used to flex the hip; one protocol starts at 30–70° and progresses to 0–120° (OrthoIllinois).

### Outcomes

- **Hip arthroscopy:** in an RCT after labral repair, patients using CPM for the first 2 weeks reported lower pain (Munsch 2021). Regular multiplanar motion, including CPM, is recommended to limit capsulolabral adhesions, a common cause of revision (PMC8811550).
- **Rotator cuff repair:** a systematic review of 4 RCTs found CPM safe, with better range of motion in 2 trials, less pain in 1 and more strength in 1 (du Plessis 2011). In a 100-patient RCT, 2 hours a day for 4 weeks plus self-assisted exercise improved motion and pain at short-term follow-up (Garofalo 2010). A smaller RCT found manual passive exercises as effective and cheaper (LaStayo 1998).
- **Microfracture:** a comparative study found no difference in outcomes between CPM with non-weight-bearing and immediate walking without CPM (eOrthopod summary). CPM after cartilage repair therefore rests mainly on laboratory evidence and protocol tradition.

## Neuromuscular electrical stimulation (NMES) and TENS

## Procedure-by-procedure prescriptions

The tables below give a typical prescription for each common arthroscopic procedure, with the postoperative day each device starts and stops. Cold therapy starts on POD 0 for every procedure and is listed only where its duration differs. VTE devices follow the individual risk assessment in the VTE section rather than the procedure.

### Knee

| Procedure | Walking aid and weight-bearing | Brace | CPM | NMES and BFR |
|---|---|---|---|---|
| Diagnostic, debridement, partial meniscectomy | Crutches POD 0, weight-bearing as tolerated, usually discarded within days | None | No | BFR optional from week 1–2 |
| Meniscal repair, standard | Crutches POD 0, weight-bearing as tolerated in a locked brace | Locked at 0° POD 0 to week 4; 0–90° weeks 4–6; off at week 6 | No | NMES from week 1; BFR from days 3–7 in one trial (NCT04436523) |
| Meniscal repair, complex or root | Non-weight-bearing 6 weeks (complex), or staged partial weight-bearing to full at weeks 8–9 (root) | Locked at 0° for 4–6 weeks, then opened in steps | Not routine | As for standard repair |
| ACL reconstruction | Crutches POD 0, weight-bearing as tolerated; off once gait is normal | Optional | No | NMES from POD 1; BFR from POD 1–3, most trials week 2–4 |
| Cartilage repair (microfracture, ACI, osteochondral graft) | Touch-down weight-bearing 6–8 weeks | Hinged brace; for patellofemoral lesions a 0–20° stop for at least 8 weeks | 6–8 h/day POD 0–1 to week 6 | Isometric NMES from week 1 |

Cold therapy runs for up to 6 weeks after ACL reconstruction and repairs, and about 1–2 weeks after debridement.

**Shoulder**

| Procedure | Sling | CPM | Other devices |
|---|---|---|---|
| Subacromial decompression, debridement | Comfort sling POD 0, off within days | No | IPC on the legs in theatre if in beach-chair position and at risk |
| Rotator cuff repair, tear up to 3 cm | POD 0; 0–6 weeks, self-weaning allowed in early-motion protocols | Optional, 2 h/day for 4 weeks | BFR cuff on the proximal arm only within trials |
| Rotator cuff repair, large or massive | Sling with abduction pillow POD 0 to week 6 | Optional | Early motion raises retear risk for tears of 5 cm or more |
| Labral repair (Bankart, SLAP) | POD 0 to week 3–6, per surgeon | No | — |

**Hip**

| Procedure | Walking aid and weight-bearing | Brace | CPM |
|---|---|---|---|
| Labral debridement, chondroplasty | Foot-flat, weight-bearing as tolerated; wean over 1–2 weeks (BayCare) | None in one protocol; others use one briefly | 4–6 h/day for 3–6 weeks |
| Labral repair with osteoplasty | Foot-flat about 20 lb for 3 weeks, then wean | 0–90°, worn when up and at night; weaning from about week 4 | 4–6 h/day for 3–6 weeks |
| With microfracture or labral reconstruction | Foot-flat for 6–8 weeks | As above, often longer | Up to week 6 (microfracture) or week 4 (reconstruction) |

**Ankle**

| Procedure | Immobilisation | Weight-bearing |
|---|---|---|
| Debridement, synovectomy, impingement | Splint POD 0 to about week 1, then weaned | Non-weight-bearing week 1, then weaned off crutches over weeks 1–3 (SLU protocol) |
| Talar microfracture | Splint, then a walking (CAM) boot | Touch-down for 6 weeks, crutches off by week 8 (SLU); an early-loading alternative allows weight-bearing as tolerated in a boot after 1 week non-weight-bearing (ACFAS review) |

**Elbow**

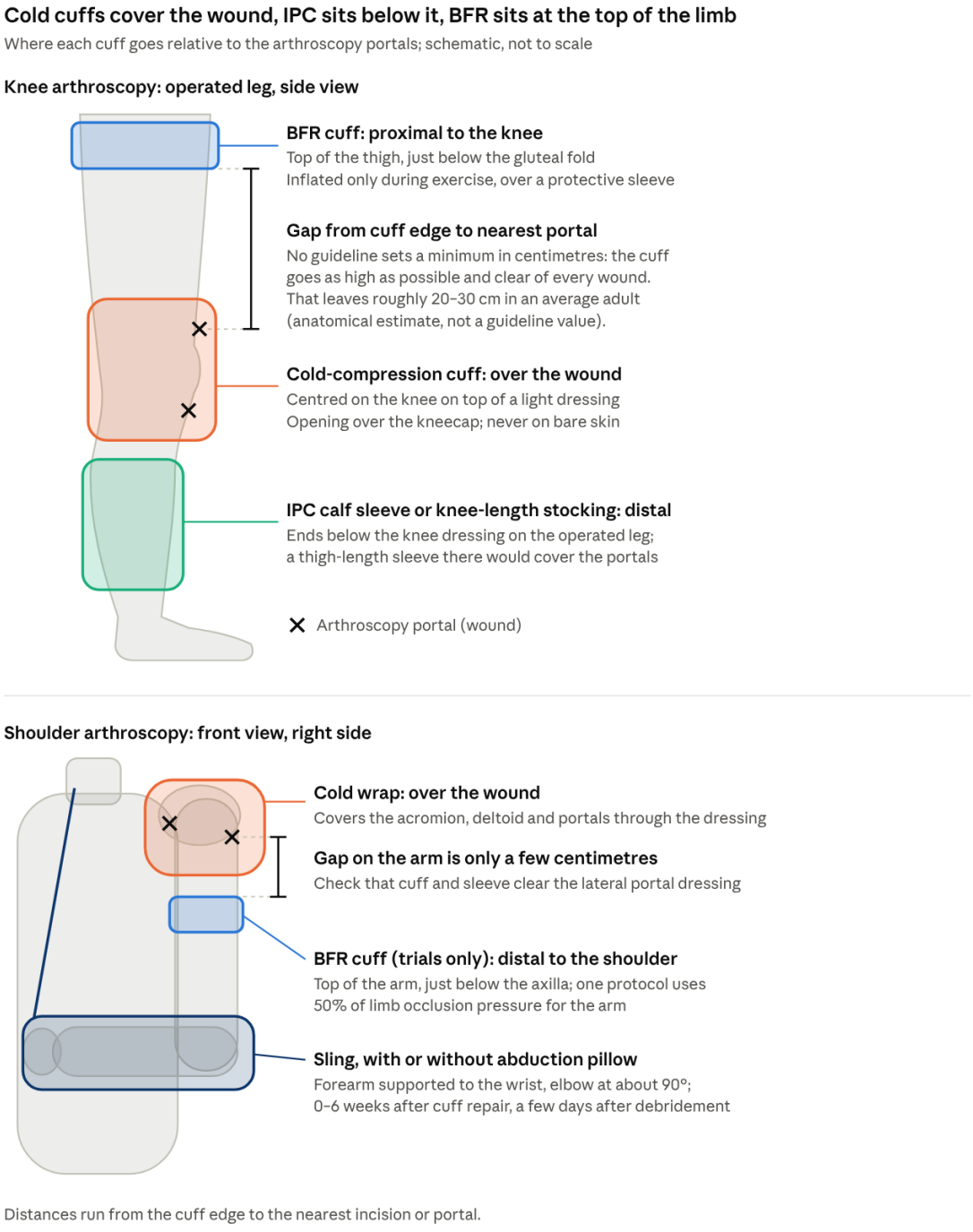
| Procedure | Sling or splint | CPM |
|---|---|---|
| Debridement, loose body removal | Comfort sling POD 0, weaned as soon as possible and fully by week 2 (TCO protocol) | No |
| Contracture release | No sling | Often from POD 0–1; an RCT found 9° more motion at 1 year than physiotherapy alone (95% CI 3–16°) and a 62% higher chance of functional motion (O'Driscoll RCT; Mount Sinai record) |

**Wrist**

| Procedure | Splint | Duration |
|---|---|---|
| TFCC debridement | Muenster splint, elbow at 90° with wrist and forearm neutral, worn at all times except hygiene | Weaning from week 4–6 (BayCare) |
| TFCC repair | Sugar-tong or Muenster splint from POD 0, then a wrist splint | Splint off at weeks 8–12 (AK Ortho) |

## Cuff placement reference: proximal, distal or over the wound

Only one post-operative cuff is deliberately placed away from the wound: the BFR cuff, at the top of the limb. Cold cuffs go over the wound, compression sleeves end below it, and no guideline gives a minimum distance in centimetres for any of them.




schematic illustration · knee and shoulder cuff positions relative to the portals

On the leg the BFR cuff sits far above the knee portals; on the arm it sits just below the shoulder, so its clearance from the lateral portal must be checked.




*Photo 7. Three sutured portals after arthroscopic meniscus surgery. These are the wound sites every device must either cover through a dressing (cold cuffs) or keep clear of (BFR cuffs, stockings, straps, electrodes).* Source: Typical arthroscopic surgery incisions – knee, by Tim1965, CC BY-SA 3.0; labelled, and this adapted image is shared under the same licence.

| Cuff or device | Position relative to the operated joint | Distance from the incisions |
|---|---|---|
| Cold or cold-compression cuff | Over it, centred on the joint | None: covers the portals through a light dressing |
| BFR cuff | Proximal for knee, ankle, elbow and wrist; distal for the shoulder | Set by landmark (as high as possible); must not touch any wound, drain or graft-harvest site |
| IPC sleeve, anti-embolism stocking | Distal (calf or foot) | Ends below the dressing; thigh-length only with caution over wounds |
| NMES electrodes | Around the joint, never on it | Distal electrode moved off the superomedial portal until healed |
| Hinged brace straps and pads | Above and below the joint | Straps and pads clear of all portals |
| Pneumatic tourniquet (theatre only) | Proximal | Removed at the end of surgery; not a post-operative device |

## Clinical outcomes at a glance

Cold compression, NMES and BFR have the most consistent trial support after arthroscopy. Post-operative bracing and CPM after ACL reconstruction, and routine heparin after knee arthroscopy, show no benefit. The table summarises the trials detailed in each device section; the verdict column can be edited as new evidence appears.

| Device and setting | Best evidence | Key result | Verdict |
|---|---|---|---|
| Cold therapy after ACL reconstruction | Meta-analysis of 7 RCTs; review of 10 RCTs (573 patients) | Less pain early; no change in motion or drainage | Benefit |
| Cold compression vs ice, ACL reconstruction | RCT, 36 patients | 83% vs 28% off opioids by week 6 | Benefit |
| Cold compression vs ice, shoulder arthroscopy | RCT, 46 analysed | No difference in pain or opioid dose in week 1 | No benefit |
| BFR vs heavy-load training, ACL reconstruction | RCT, 24 completed | Equal strength gain; pain fell 67% vs 39% | Benefit |
| BFR added to low-load training from week 4, ACL reconstruction | RCT, 30 patients | No added short-term benefit | No benefit |
| NMES added to rehabilitation, ACL surgery | Meta-analysis, 11 RCTs (402 patients) | Stronger quadriceps short and long term; Lysholm unchanged | Benefit |
| LMWH vs nothing, knee arthroscopy | RCT, 1,451 patients | Symptomatic VTE 0.7% vs 0.4%, not significant | No benefit |
| Stockings vs LMWH, knee arthroscopy | RCT, 1,761 patients | Composite VTE 3.2% vs 0.9%; less bleeding with stockings | Mixed |
| Brace after ACL reconstruction | 11 RCTs | No advantage | No benefit |
| CPM after ACL reconstruction | 6 RCTs | No advantage | No benefit |
| CPM after rotator cuff repair | Review of 4 RCTs; RCT of 100 | Better early motion and pain in some trials; manual exercises equal in another | Mixed |
| CPM after elbow contracture release | RCT, 51 patients | 9° more motion at 1 year | Benefit |
| CPM after hip arthroscopy | Small RCT | Lower pain in the first 2 weeks | Benefit |
| Shorter sling time, small to medium cuff tears | RCTs of 206 and 80 patients | Better early motion, less pain at 6 months, no rise in retear | Benefit |
| Early motion, cuff tears of 5 cm or more | Pooled data | Retear 52.2% vs 22.6% with delayed motion | No benefit |

## Safety, contraindications and red flags

Most device harm comes from pressure and cold on skin the patient cannot feel, so the first 24 hours under a nerve block are the riskiest. Every device that wraps a limb needs a skin and circulation check at each session, and patients must know which symptoms mean stopping the device and calling the team.

### Device-specific hazards

| Device | Main hazard | Prevention |
|---|---|---|
| Cold and cold-compression cuffs | Cold burn, cold-induced nerve palsy | Barrier between device and skin; skin checks every 1–2 hours; avoid in cold allergy, Raynaud's or reduced sensation |
| BFR cuff | Bruising, numbness, rare thrombosis or rhabdomyolysis | Pressure set from measured LOP; protection sleeve; screen out prior VTE, vascular disease, active cancer |
| Stockings and IPC | Pressure sores at heel and bony points, arterial compromise | Measure and refit as swelling changes; remove daily; do not fit in arterial disease or neuropathy |
| Braces and slings | Strap pressure on portals, nerve compression | Hinges at the knee's sides; straps clear of wounds; neck strap padded |
| Crutches | Axillary nerve compression, falls | Weight through the hands; correct height; stairs taught before discharge |
| CPM | Wound stress, malalignment | Machine hinge at the joint; limits set to protocol; stop if drainage increases |
| NMES and TENS | Skin irritation, interference with implanted devices | Electrodes off wounds; never over a pacemaker or defibrillator |

### Red flags to teach every patient

| Symptom | Possible cause | Action |
|---|---|---|
| Sudden breathlessness, chest pain, coughing blood | Pulmonary embolism | Emergency services immediately |
| Calf pain, swelling or warmth, especially one-sided | Deep vein thrombosis | Same-day medical review; remove BFR and compression devices until assessed |
| Pale, blue, cold or numb fingers or toes beyond a cuff, brace or sling | Circulation or nerve compromise | Loosen or remove the device at once; call the team if not relieved within minutes |
| White, waxy or blistered skin under a cold device | Cold injury | Stop cold therapy; seek review |
| Spreading redness, discharge or fever | Wound infection | Contact the surgical team the same day |
| Pain that keeps rising despite rest, elevation and medication | Compartment problem, haematoma, infection | Urgent review |

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Institutional rehabilitation protocols cited for timing are linked in the sections where they are used.

**Photographs**

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