

Medical Considerations for Patient Tie-ins

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Take a minute of your time to read this, and to think about the medical aspects of how you tie patients into a litter.

I'm not thinking about security: you don't want your patient to fall out of the litter, even on a nontechnical evac, so every patient needs to be secure in the litter. I'm not thinking about packaging for hypothermia, or rigging the tie-ins to secure a patient with a broken leg, broken rib, whatever.

I'm thinking about the medical effects of your tying the patient into the litter. What effects will this have?

Well, first, the patient can't move. Immobilization has several medical effects.

For someone with a broken spine, immobilization may prevent neurological injury to the spinal cord or the nerve roots coming out of it. For other broken bones, immobilization is good, too, at least up to a point. Actually, for certain fractures, too much immobilization can be bad. For instance, assume someone who has a small fracture of the head of the radius (just beyond the elbow, on the outside of the arm). How long should it be immobilized? Only for about three days, and only using a sling. After this, you need to get it moving again to prevent permanent stiffness in the joint. It'll be rare that you care for someone with a radial head fracture for more than three days, but the point is that immobilization is not always good.

Immobilization also tends to make bones weaker, but this effect occurs over weeks, and is not likely to be a problem during cave rescue.

Immobilization means that blood doesn't get pumped back to the heart very well. The veins pump blood back to the heart by way of one-way valves (see Figure). They work when the surrounding muscles alternately contract and relax, squeezing different parts of the vein. If the legs and arms aren't moving, there is no pumping action, and blood tends to stagnate in the arms and legs. This means there is less blood return to the heart, and the arms and legs may even get puffy ("edema") from the extra fluid there. For this reason, immobilization is a significant risk factor for a clot in the leg (a deep venous thrombosis or DVT). Pieces may break off the clot and travel to the lung (a pulmonary embolism or PE). When it reaches the lung, it prevents blood from getting through the lung. This usually produces chest pain, shortness of breath, and if large enough, immediate death.

Another important risk factor for DVT and PE is dehydration. Cave rescue patients are almost invariably dehydrated, from cold exposure and hypothermia if from nothing else. A third risk factor, quite relevant to cave rescue, is local trauma to the legs.

So, you see, by tying the patient into the litter, you're taking a patient who is at high risk for DVT and PE and immobilizing him or her, making DVT and PE even more likely.

Is there anything you can do?

If the patient is conscious, you can prompt the patient to alternately tighten and relax the legs. If you have a long wait because some of the rigging isn't ready, and the patient doesn't have a suspected spine injury, untie the patient and let him or her move around a little. Try to hydrate the patient as best you can: IV fluids if available, Gatorade or something similar if it's OK for the patient to take oral fluids. (I'll discuss oral fluids in another article.)

There are medications that may help: blood thinners will help prevent clots. However, if your patient is bleeding, or may be bleeding, blood thinners are not a good idea. (For instance, if someone suffered a blow to the head with decreased level of consciousness, then you would worry about bleeding in the brain, and not give blood thinners.) One blood thinner that you probably have in your pack is aspirin. A single small dose of aspirin is all it takes. (The dose is about 40 mg., which is half a "baby" aspirin, or a small fraction of a 325 mg. regular adult aspirin.) Larger doses don't have any more effect and may have less of a blood-thinner effect. Heparin is a blood thinner that is more potent than aspirin, but must be given as an injection into muscle or through an IV. However, heparin is not a standard prehospital drug even for paramedics, and should only be given on a doctor's order.

There is one final thing that you can do. Be careful of your leg tie-in. Anything tight around the leg or ankle will decrease venous flow and promote clotting. If you can leave room for the patient to wiggle his or her legs, that's even better.

The next time you package a patient, think about venous flow, DVTs, and PEs.