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Bony Overgrowth

Bony overgrowth (sometimes called terminal overgrowth) can occur when an amputation transects the bone. It is characterized by swelling, warmth and tenderness at the end of the residual limb. Overgrowth is believed to be "the consequence of a local (occurring at the end of the bone) biologic phenomenon," which is a result of "the malfunction of established mechanisms of wound healing and normal bone growth." In simpler terms, when a bone is cut, the body instinctively works to heal itself. Combined with normal bone growth the cut bone's growth may exceed that of the overlying soft tissues putting pressure on them, eventually leading to a protrusion, then a sore, and even sometimes piercing the skin.

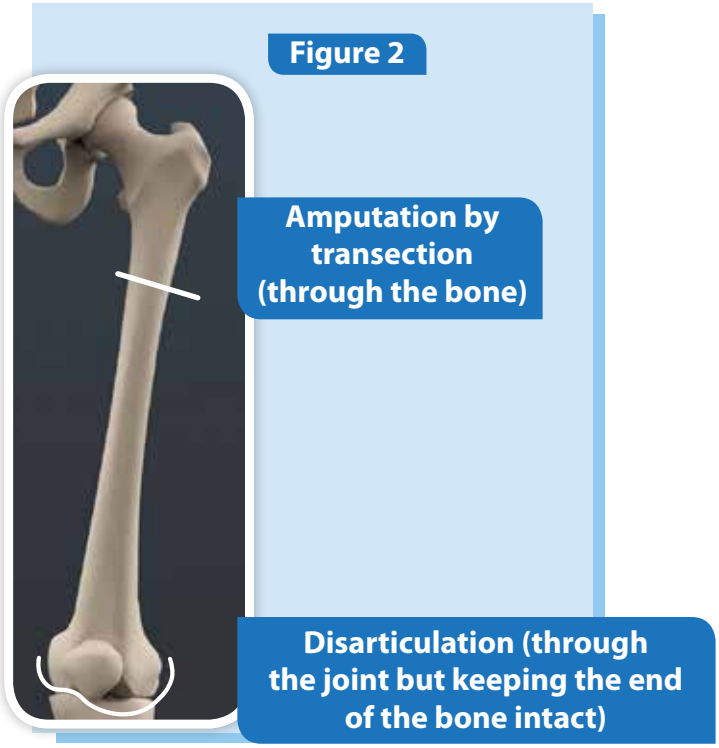
The incidence of bony overgrowth is reported at between 4% and 35%. It occurs most commonly in children under 12 years of age, and never after a person reaches skeletal maturity. It may occur following traumatic amputations (where surgery is performed to remove a limb) or with congenital amputations. For congenital amputees, it may occur where an "amnion rupture sequence" (also known as amniotic band syndrome, congenital constriction bands, or Streeter's dysplasia) was the cause of the limb loss. This kind of amputation is in fact a traumatic amputation that occurs when the amniotic sac ruptures and bands are formed when the fetus becomes entangled in the placenta. Bony overgrowth does not occur in congenital amputees where the cause of the limb loss originates during the development of the embryo.

Bony overgrowth occurs with certain types of amputations more than others. In order of frequency it affects the humerus, fibula, tibia and femur [figure 1]. Some articles indicate the tibia/fibula are affected more than the humerus. However, even without complete agreement on the frequency of bones affected, it can be said that bony overgrowth is most common for above elbow and below

Figure 1

knee amputees, and is never experienced in below elbow amputees. Bony overgrowth does not occur with disarticulation amputations (where the amputation is through the joint and no bone is actually cut [figure 2]).

Femur



Numerous techniques have been used over the years to treat and prevent bony overgrowth. Revision surgery to cut and shorten a bone that has overgrown surrounding tissue causing serious discomfort is the standard treatment. Once surgery becomes necessary for bony overgrowth, further re-growth often necessitates repeated stump revisions at two- to three-year intervals until the child is 12 years old or reaches skeletal maturity. In an attempt to prevent overgrowth, various techniques of "capping" the cut bone have been used (covering the end of the bone to prevent re-growth). Synthetic materials like silastics and metals have been used for caps, though less often because of problems of breakage and dislodgement. Taking bone from another part of the body has been used as a bone graft to form the cap. Other techniques include the Ertl procedure (creating a bone bridge between the fibula and tibia) and skin traction. These techniques and their success rates can be discussed with the orthopaedic surgeon if bony overgrowth becomes an issue.

Bony overgrowth is one of the most common complications of amputation surgery for children, though the incidence of occurrence may not be high. It is important for families to be aware of this phenomenon to ensure it is properly assessed and treated by a specialist if signs of it appear and persist. Although it is difficult when a young child must undergo revision surgery due to bony overgrowth, families can be encouraged by the fact that it will eventually cease to be a concern once the child reaches skeletal maturity.

Sources:

- *The Child With a Limb Deficiency*, edited by John A. Herring, MD and John G. Birch, MD and published by the American Academy of Orthopaedic Surgeons.
- *The Limb Deficient Child*, edited by Yoshio Setoguchi, MD and Ruth Rosenfelder, RPT.
- *Atlas of Amputations and Limb Deficiencies*, edited by Douglas G. Smith, MD, John W. Michael, MEd, CPO, and John H. Bowker, MD.