



Orthopedic Care Center Hand and Orthopedic Upper Extremity Program Thumb Hypoplasia and Aplasia

The **Hand and Orthopedic Upper Extremity Program** provides comprehensive care for infants, children and adolescents with a wide range of complex upper limb conditions. Multidisciplinary care involving occupational and physical therapy, splinting, casting and reconstructive surgeries is provided for congenital, neuromuscular, sports-related oncologic, traumatic or post-traumatic conditions.

What is thumb hypoplasia and aplasia?

The spectrum of hand deformities range from a slightly smaller and weaker thumb to a completely absent thumb. The appearance of these latter conditions -- known hypoplasia if the digit is unusually small and underdeveloped, or aplasia if the digit is missing, can be quite disturbing to parents. However, children will adapt and can function without a missing finger. If left alone, children who have no use of a thumb will learn to rely on a lateral pinch between the long and index fingers. However, they may have problems with fine motor activities such as pinching and grasping. It is these children who may require surgery to correct the problem.

In general there are five types of thumb hypoplasia or aplasia:

- The thumb is slightly scaled down in size, but all of the structures of the thumb, the bones, tendons, ligaments, muscles and joints are normal.
- The thumb is small, and there are abnormalities in the tendons, muscles and the middle joint of the thumb (metacarpophalangeal joint) is unstable, causing the thumb to wobble. The web space between the thumb and index finger is tight and restricts movement.
- The bones of the thumb are abnormally small. There are abnormalities in many or all of the muscles of the thumb along with a range of problems in the joints of the thumb and an abnormal tight web space between the thumb and index finger.
- A floating thumb with no bony support, attached to the hand by only skin and soft tissue.
- Complete absence of the thumb.

What causes an underdeveloped or absent thumb?

The cause of this condition is unknown. However, these kinds of thumb deformities are rare, occurring perhaps once in 100,000 live births. It can occur in isolation or in association with syndromes that involve the radial side of the hand (side of the hand on which the thumb lies.) These include Holt-Oram and Fanconi Syndromes. It is also routinely seen with radial club hand.

How is underdeveloped or absent thumb diagnosed?

Underdeveloped or absent thumb is usually detected during your baby's first neonatal exam. Detection of this deformity will prompt your baby's doctor to look for associated syndromes or other deformities mentioned above. An x-ray will be used to look at the internal structures of the thumb. Other tests will depend on whether the doctor believes the thumb deformity is associated with another condition.

Treatment

Treatment for underdeveloped or absent thumb can be very complex. Specific treatment will vary from child to child and will be determined by your child's physician based on:

- your child's age, overall health, and medical history
- the severity of the condition
- any other deformities or syndromes associated with the problem that may take precedence
- your child's tolerance for specific medications, procedures, or therapies
- your opinion or preference

The decision as to whether or not the abnormality should be treated is not always straightforward. While most surgeons recommend an operation to correct the problem in cases where hand function is impaired, your feelings and attitudes about the

procedures will be taken into account. If there are no other pressing medical concerns that need to be addressed, surgery is generally performed between 6 and 18 months of age.

The following is a general description of options for treatment:

No treatment— In cases where hypoplasia of the thumb is so minor that hand function is not impaired, it can be left alone.

Reconstruction of the thumb— This may involve one operation to release the tight web space between the thumb and index finger using skin grafts, stabilize the middle joint through ligament reconstruction and improve function of the muscles in the thumb, by transplanting a muscle from another finger, usually the little finger.

Pollicization— This procedure is used when there is no thumb or when the hypoplasia is more severe. It is a term used to describe an operation that involves creating a functional thumb by transferring the child's index finger. This may seem drastic because a normal index finger is being sacrificed. However, most surgeons will tell you that since function of a thumb is crucial to function of the whole hand, a three fingered hand with a thumb will enable a child to have considerably better hand function than a four fingered hand with no thumb. Surgeons and parents also find that a hand with one thumb and three fingers appears quite normal. This operation has an excellent track record. It is well understood and the results are very reliable. In cases where the index finger is indeed normal and functional, a very good thumb results. It should be noted however, that the decision to undergo this procedure relies heavily on the condition of the functional quality of the index finger. If the index finger cannot move independently or has other problems, pollicization may not be warranted.

Clinical Team

Peter M. Waters, MD
John E. Hall Professor of Orthopedic Surgery, Harvard Medical School
Clinical Chief, Orthopedic Surgery, Children's Hospital Boston

Donald S. Bae, MD
Assistant Professor of Orthopedic Surgery, Harvard Medical School

Apurva S. Shah, MD
Clinical Fellow in Orthopedic Surgery

Locations

Children's Hospital Boston
300 Longwood Avenue
Fegan 2
Boston, MA 02115

Children's Hospital Boston
at Waltham
9 Hope Avenue
Waltham, MA 02453

Children's Hospital Boston
at Lexington
482 Bedford Street
Lexington, MA 02420

Boston Children's North
10 Centennial Drive
Peabody, MA 01960