

Casting for Early Onset Scoliosis:

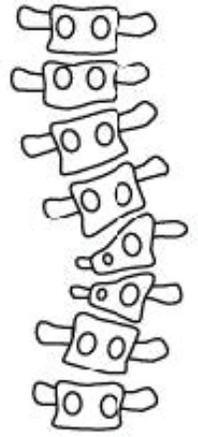
A Physician's Perspective

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Progressive infantile scoliosis (a type of early onset scoliosis) is a disease that can cause very significant breathing issues, even in early life. Normally, the lungs continue to develop until a child is at least eight years old. A significant spine deformity can also result in significant rib deformity. The combination of spine and rib deformity can result in a chest that gives the lungs no space in which to grow. Fortunately, treatment is possible.

A common misconception is that the deformity resides in the inter-vertebral disks, so the spine must be "stretched" to provide correction. Unfortunately, the more significant component of the deformity resides in the vertebral bones themselves. Thus, the physician must use growth as a corrective mechanism to provide any lasting correction. Fortunately, growing bones follow the Heuter-Volkman principle. This principle is that bone will grow faster under tension and slower under compression. Therefore, when the deformity is reversed in a cast, there is a good chance that the deformed bone will grow less deformed, if there is adequate remaining growth. Conversely, not managing a child's deformity will cause the curve to progress. I have witnessed curve progression of over 20 degrees in a single month without management. Infants from birth to four or five years of age have tremendous growth rates. This is the time when rapid progression will occur without management, and improvement with casting is possible.



Early Treatment with Mehta's Growth Guidance Casting (MGGC)



Dr. Min Mehta pioneered a casting program for progressive infantile scoliosis and published the first series of children treated early with EDF (Elongation, Derotation, Flexion) casting in the 1970's. She described a plaster over the shoulder cast with a mushroom shaped belly hole to allow for breathing and eating and a posterior D-hole to allow the spine to derotate. Demonstrating the validity of her casting program, Dr. Mehta followed the children to adulthood. Approximately one third of the children were cured of their scoliosis; the remaining two thirds were managed until an older age. Some might argue that

the two thirds that did not achieve a cure wasted their efforts. I do not think that any spine surgeon would agree with that argument. The chance of being cured is so exciting and beneficial that I doubt anybody would pass on the chance. It is my belief that, even if total cures were never possible, the early casting would still be extremely valuable. The same Heuter-Volkman principle that allows physicians to correct a curve in a cast will cause the curve to progress in a child, who is not managed. The deforming forces increase as the deformity increases. Thus, the casting is useful to both prevent worsening and almost always provides some significant improvements. Passing through infancy with the smallest curve possible is a great advantage to any child.

It is best to start casting as soon as possible, after the diagnosis of progressive infantile scoliosis is confirmed. By age four or five, growth slows down significantly and hopes of correction are greatly reduced. If a child has not achieved a cure by age four or five, I will generally suggest we change from casting to bracing. At this point, parents may choose casting for children, who will not wear their brace or if we cannot get

a good correction in a brace. The slowed growth at four or five has two significant effects. First, without rapid growth, the curve is not likely to respond to casting. Second, without rapid growth, rapid progression of the curve is not expected. Thus, after age five, the extra burden of a cast over a brace is not likely to be worth the benefits.

A reasonable question would be, "If casting is so very helpful to a child less than age five, then why not bracing?" They seem so similar. The bottom line is that it is simply an observed fact: casting generally provides lasting correction while bracing does not. My first cures were all in children, who were doing poorly in a brace. Some of the reasons Mehta style casting may be superior are below.

- A cast cannot be loosened or easily removed. Basically, compliance is 100% assured.
- Essentially, all braces are made by first casting a child; hence, something is always lost in the transfer from cast to brace.
- Braces are changed when children outgrow them, but casts are changed on a regular schedule, hopefully improving the correction each time. Thus, serial correction can occur.
- Casts are applied in the operating room with traction as a major corrective force, while bracing employs primarily three point bending to gain correction.

The bottom line is that we are not certain why casting can provide correction, which is rarely if ever seen with bracing, but it certainly does.



Casting comes with some downsides, of course. First, it is a long process. Generally a minimum of eighteen months of casting is required to even have a chance at a cure. Placing only two or three casts has very little value. There is some concern about the traction needed to place a cast. Although it has never been reported, it seems possible to damage a cranial nerve or the spinal cord during the casting process. Some degree of skin irritation can be expected with every cast, and significant sores can occasionally develop under a cast. Probably the most concerning is the unknown effects of repeated exposure to

anesthesia. There exists some research suggesting that prolonged exposure to anesthetic gases may be related to learning differences in children. However, more research is needed to determine if this threat is a legitimate concern with Mehta casting.

My protocol

My protocol for caring for infantile scoliosis follows very closely to that recommended by Dr. Mehta. The child is brought into the clinic as soon as possible for an evaluation. Radiographs are taken and assessed to assure the child truly has infantile scoliosis and not some other type of anomaly. The radiographs are then assessed for curve magnitude, RVAD, and rib phase (these are radiographic measures developed by Dr. Mehta to assess risk of progression). If the curve clearly falls into the progressive type based on this data, the child will be scheduled for an MRI of the entire spine and casting as soon as possible. If the data is equivocal, meaning that the curve less than 20 degrees, the RVAD is less than 20, and the rib phase 1, then the child is scheduled for MRI and casting in about six weeks.

Repeat radiographs are taken at five weeks, and the procedures are cancelled, if the curve has shown evidence of spontaneously resolving.



If a child is being observed for “presumed spontaneously resolving scoliosis”, follow-up should be very close. Dr. Mehta suggested that visits should be no more than two months apart, when observing a curve that gets better on its own. Assuming casting is warranted, I will place an underarm cast, if the apex of the curve is at the seventh thoracic vertebrae or below, and place an over the shoulder cast for higher curves or if the child has a body shape that makes me believe the cast may not stay in position. On this one point, I vary slightly from Dr. Mehta in that she always employed over the shoulder casting. I use Mehta’s classic mushroom shaped front hole and the posterior D shaped hole. I take a radiograph in the OR in the first cast, and then may go six or more months before I order another in the clinic out of the cast. Families are sometimes frustrated that more radiographs are not made to document the progress, but I remind them that we need to limit radiation exposure. As long as there is visible rib deformity, there will be continued spine deformity.

If a child achieves a cure, I apply a final cast. After four to six weeks, this cast is removed in the clinic by my brace team and converted into a brace. The child wears this brace until they outgrow it (usually 12-18 months). Then, I perform very concerned observation until the end of growth.



If a correction stagnates around four years of age, I will cast for another six months to a year, if the family is willing. If no further correction occurs, I will move to a brace, acknowledging that a cure is not possible. If needed, growing rods, including Magec rods, anterior spinal tethering, VEPTR, or other growth friendly surgical techniques will be offered, when the child reaches eight years old. It is very desirable to delay surgical procedures as late as possible, as occasionally, spontaneous fusions can occur. Imagine the dilemma facing a surgeon, who places growing rods in a four year old child. If a spontaneous fusion should occur even three years after the initial implantation, the child will only have the chest height of a seven year old at maturity.

There is no good salvage when failures like this occur.

Common Questions

There are many common concerns and questions families facing casting may have, and below, I attempt to answer many of these concerns:

Will my child receive a Risser or a Mehta cast? Mehta casting the way described above is what is certainly most useful for infantile scoliosis. Unfortunately, hospitals are paid based on a series of procedural codes developed by the federal government. There is no code for Mehta casting, so your surgeon will code it as a Risser cast and you will receive payment information from your insurance for a Risser cast. As long as the cast looks somewhat similar to the cast depicted above by Dr. Mehta, your child is in what we physicians would call a Mehta cast.

Should my child receive an underarm or an over the shoulder cast? This is a challenging question. Even in the casts photographed for Dr. Mehta, we can see that the shoulder straps are not pushing down on the shoulders. If they did, the cast would damage the child’s brachial plexus, which provides motor and sensory function to the hands and arms. My personal solution to this issue is to apply shoulder straps, when the curve is higher in the chest or when the child has a body shape that may not hold the cast in position.

Should my child receive a plaster or a fiberglass cast? Dr. Mehta’s original series used plaster casts, so I have always stayed with that. I am aware that many of my colleagues place a thin plaster cast and then overwrap it with fiberglass. I see nothing wrong with this technique.



Can any spine surgeon apply a cast? Unfortunately, no. I have a special table that allows for safe positioning and traction needed to properly apply a cast. Most hospitals do not have such a table. I have seen several functional casts applied by physicians without a table to temporize a child until they could be referred. It is clearly the hope of the members of the Infantile Scoliosis Outreach Program (ISOP) that more hospitals will fabricate or purchase tables and allow their surgeons time to use the Mehta casting process, so it can be offered more widely.

How long will my child need casting? I always answer this one with an honest “I don’t know”. I generally tell parents we need to commit to eighteen months to have any chance of a cure. They note that the deformity developed rapidly, so why can’t we cure it rapidly. It all comes back to growth again. A young infant is a powder keg of growth potential. They can progress a curve extremely rapidly, which is why close follow-up (no longer than six weeks or two months) for an infant, who is not casted, is so important. But the growth rate of infants is continually slowing, so it is never possible to cure a curve as fast as it developed. I remind the families at every visit that a cure is never guaranteed. But even if a lack of a cure were guaranteed, I would still support casting as a way of assuring the curve does not progress out of control, forcing a growing surgical strategy with the accompanying risks at an early age. I encourage my families to commit to at least an 18 month trial. Applying two or three casts is of no value, in my opinion.



In 2007 I had to pleasure of learning casting for infantile scoliosis from Dr. Min Mehta. Almost immediately, Mehta casting became a large part of my practice. The information provided is a review of how I have implemented the principles of Mehta casting into my practice. Please realize that these are only one surgeon’s view on how to best deliver these treatments. Your surgeon may vary substantially from what I have written. I anticipate that many surgeons will have different ideas on what radiographs are needed, the exact shape of the cut outs, materials, and many other things. What should not vary is the principle of serial casting a rapidly growing infant.

Learn more about casting and early onset scoliosis at InfantileScoliosis.org



**Infantile Scoliosis
Outreach Program**

ISOP is a program of Ability Connection Colorado
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