

What's the Evidence?

Is Selective Percutaneous Myofascial Lengthening an Effective Treatment for Children with Cerebral Palsy?

Key findings

- Selective Percutaneous Myofascial Lengthening (SPML) is a surgical procedure that aims to lengthen certain muscles, or to reduce tone in the muscles.
- The procedure involves making small cuts through the skin to reach and divide the connective tissue around muscles.
- Advocates claim that SPML will improve the ability of children with cerebral palsy to sit, stand or walk.
- Only one published, peer-reviewed study was identified that looked specifically at the effectiveness of Selective Percutaneous Myofascial Lengthening.
- There is currently no high quality evidence for the effectiveness and safety of this surgery for children with cerebral palsy.

Published May 2018

What were we asked?

We were asked about the effectiveness of Selective Percutaneous Myofascial Lengthening (SPML) for children with cerebral palsy. Specifically, we were asked about the effectiveness of this treatment compared to Selective Dorsal Rhizotomy (SDR). However, as SPML and SDR aim to address different problems, it isn't appropriate to compare them. We therefore looked instead for any studies comparing SPML to conventional orthopaedic surgery to lengthen muscles and tendons.

Advocates of SPML claim several benefits:

- 1) Improves the movement ability of children to sit, stand or walk;

2) Prevents the development of contractures—where muscles are shortened and joint movement is limited;

3) By preventing contractures, spasticity can be decreased.

We looked to see if there was evidence to support these claims.

What did we do?

We first carried out a general Internet search for Selective Percutaneous Myofascial Lengthening. We then searched NHS Evidence, Cochrane, TRIP, NICE, and PubMed databases. We looked for studies that

evaluated the effectiveness of SPML for children with cerebral palsy.

What did we find?

What is spasticity?

Muscle tone is maintained by a circuit of information passing along nerves to and from the spinal cord. When muscles are stretched, the sensory nerves from the muscles send signals to the spinal cord, which causes a message to be sent back to the muscle making it contract. This signal back to the muscle is usually reduced by controlling signals from the brain to the spinal cord. Cerebral palsy affects these controlling signals from the brain, and the muscles contract without the person being able to control it. This is called spasticity. People with spasticity describe their muscles as feeling tight or stiff and difficult to move.

Spasticity can prevent the muscles from growing and keeping up as children's bones grow longer. This causes a contracture or short muscle that reduces the range of movement at joints. One way of dealing with short muscles is to lengthen them using surgery. There are many methods by which muscles or tendons can be lengthened.

What is Selective Percutaneous Myofascial Lengthening (SPML)?

SPML is a specific surgical technique to lengthen muscles, in order to improve the movement ability of children with cerebral palsy to sit, stand or walk.

The procedure can be performed on different muscles which are selected based on where the child experiences spasticity.

The operation involves making small incisions, or cuts, through the skin in order to reach the surface of the muscle that is tight or

shortened. There is connective tissue or myofascia on the surface, or sometimes within the substance, of some muscles. When the myofascia is cut, the muscle may stretch and lengthen more easily.

Because the incisions are made through the skin, it is sometimes described as a minimally invasive surgical technique, or 'keyhole surgery'. This means it can be performed as an outpatient procedure, so no overnight stay in hospital is required. It is usually performed under general anaesthetic. Providers of the surgery state the procedure leaves little, or no, scarring.

However, because it is done percutaneously (through the skin), only certain muscles that are close to the skin can be safely accessed to divide the myofascia. This means some muscles that are also contracted may not be adequately addressed. The procedure is done without the surgeon being able to see the part of the muscle or tendon that is being cut. This means it is difficult to know how much additional damage might be done to the muscle, potentially doing more harm than good. Furthermore, in children with spasticity, there might be other orthopaedic problems like bone deformities that cannot be addressed by SPML.

At the time of publication, we are not aware of any surgeons in the UK performing SPML. Most reports of SPML come from the USA as well as some European countries.

What is the conventional orthopaedic surgery to lengthen muscles and tendons?

The conventional surgery to lengthen muscles and tendons is open surgery. This involves the surgeon making an incision using a scalpel and opening up the part of the body so that the muscle and tendon is in direct vision. It would take place under general anaesthetic. The

exact technique used would depend on a number of factors including the anatomy of the muscle and the degree of correction required.¹ One example of a specific type of conventional surgery for lengthening tendons is the Strayer procedure or Gastrocnemius Release.

What is the evidence for SPML?

- We identified one published peer-reviewed study that looked specifically at the effectiveness of SPML. This study reports on 58 children with spastic cerebral palsy who had the surgery. They found that two years after the operation the movement ability of all children to sit, stand or walk had improved. However, this study reports on a series of cases without any control group. This means we have no way of knowing whether the results are due to SPML or something else.²
- The only other evidence in support of SPML which we have been able to identify comes from case reports. This data comes from two surgeons, Dr Yngve and Dr Nuzzo, who both work in the USA. Each report follows a group of patients who underwent SPML and there is no control group for comparison. This makes it difficult to know whether any effects are due to having had SPML or something else. As these reports are not peer-reviewed, their quality is unknown and should therefore be interpreted with caution.

A published summary from a conference presentation by Dr Yngve's team reports on 40 children who underwent SPML. They found no significant change in the ability of these children to sit, stand or

walk. Data from 28 of these children found a significant improvement in some aspects of Quality of Life (physical, emotional, and social aspects of living with cerebral palsy), but not others.³ Another summary from a conference presentation by Dr Yngve and colleagues reports on 516 patients who had the procedure. It isn't clear whether they were all children or not. They state 11% had the operation again between 1 and 6 years later.⁴

Dr Yngve used video before and after the surgery to suggest that the procedure had improved the children's walking pattern. Additionally, his review of 184 patients revealed 13 minor complications.⁵

A second surgeon from the USA, Dr Nuzzo, has also published online some of his results performing SPML with patients over a 5 year period. It is unclear whether all patients were children or not. Patients had a range of conditions including cerebral palsy. Of 278 patients, 4 needed to be admitted to hospital following the procedure. 1 in 10 required the surgery to be repeated in the same part of the body. There were no cases of infection, over lengthening of the muscle, or nerve injury.⁶ However, since many patients that received this treatment were from distant locations, it is unclear whether the outcomes reported could or did include those patients who were from elsewhere. This could mean that complications after surgery were under-reported.

- We found one peer reviewed published paper that questions the safety and the effectiveness of percutaneous myofascial lengthening of the hamstring muscle.⁷ In

this study, the surgeons first performed the surgery through the skin (percutaneously). A second surgeon then opened the incision to expose the muscle to determine what was actually cut and proceeded to complete the lengthening under direct vision. The authors found that performing the procedure percutaneously usually led to more inadvertent damage to the underlying muscle. The percutaneous procedure also had a smaller effect on the length of the muscle when compared with the conventional open procedure.

What do we think?

We did not find any studies that compared SPML to conventional orthopaedic surgery to lengthen muscles and tendons. We are therefore unable to draw any conclusions about which of these procedures is the most effective for improving the movement ability of children with cerebral palsy to sit, stand or walk.

The available research on SPML is of very low quality and/or uses small sample sizes. There is currently no high quality evidence for the effectiveness of SPML for children with cerebral palsy. Furthermore, there is some evidence which questions the safety of SPML.

We would like to hear your feedback on this summary – please email us at pencru@exeter.ac.uk if you have any comments or question

References

- 1 Fitoussi, F & Bachy, M. (2015) Tendon lengthening and transfer. *Orthopaedics & Traumatology: Surgery & Research*. 101(1): 149-57.
- 2 Mitsiokapa E.A., et al. (2010) Selective percutaneous myofascial lengthening of the lower extremities in children with spastic cerebral palsy. *Clin Podiatr Med Surg*. 27(2): 335-43.
- 3 Wu L., Isidro T., Yngve D.A. (2016) Impact of Selective Percutaneous Myofascial Lengthening on Quality of Life. Podium presentation and “Top Five” poster presentation. *American Academy of Physical Medicine and Rehabilitation*. New Orleans, LA.
- 4 Yngve D.A., Wilson W.K. (2014) Reoperation Rates after Minimally Invasive Muscle-Tendon Lengthening for Cerebral Palsy. *Western Orthopaedic Association 78th Annual Meeting*. Big Island, HI.
- 5 Yngve D. (2016) SPML Frequently Asked Questions. [Online] Available at: <https://www.utmb.edu/Ortho/Faculty/Yngve.aspx>
- 6 Nuzzo, R. Percutaneous Lengthening. [Online] Available at: http://www.pediatric-orthopedics.com/Treatments/Muscle_Surgery/Perc_Lengthening/perc_lengthening.html
- 7 Mansour, T., Derienne, J., Daher, M., et al. (2017) Is percutaneous medial hamstring myofascial lengthening effective and safe as the open procedure? *Journal of Children's Orthopaedics*. 11. (1): 15-19.

Note: the views expressed here are those of the Peninsula Cerebra Research Unit (PenCRU) at the University of Exeter Medical School and do not represent the views of the Cerebra charity, or any other parties mentioned. We strongly recommend seeking medical advice before undertaking any treatments/therapies not prescribed within the NHS