

MEDICAL KNITTED ORTHOTICS, NEW YARNS, STRENGTH AND HEALTH

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Abstract

The main directions of research are aimed at the development of new orthotics.

Orthotics, both as a history and the area of usage, are textiles used in the medical field with a relatively high frequency now.

Statistics show that 80% of the population has accused at least one time during their life back or limb joints pain. Compression is one of the therapies for the treatment of lumbar diseases, upper and lower limb joints.

The new products proposed have a flexible design and a controllable elasticity.

The knitted orthoses which generated this compression contain cotton yarns with lycra core ensuring the all properties of comfort.

The yarn is the key item that orthoses are built upon and its structure represents how the knitting of yarns is done.

The appeal of a technical article consist in the yarn structure, quality and how the yarn knitting is realized. [1]

Key words: knitted orthotics, compression, yarns, elasticity

1. Introduction

Due to materials development, medical and surgical methods of treatment in various diseases and manufacturing technology, orthotics use area expanded, including pathology orthopaedic, neurologic, rheumatologic, but also in plastic and reparative surgery, neurosurgery, traumatology, medical sports, occupational medicine, pathology musculoligamentar overloading.

At the moment, the orthotics are one of the main work of pressure therapy and of discipline called rehabilitation.

2. Causes of diseases and applications of new orthotics

Approximately 3% of our population may benefit from using some type of orthotic device. A smaller percentage of that total requires a lower-extremity orthosis. A broad range of individuals with many different and varied diagnoses might benefit from the use of a lumbar orthosis. Some general categories include individuals with spine disease and trauma.

Spine trauma occupies a leading position in terms of severity and consequences, a problem of major significance in terms of medical, social and economic.

Lumbar zone make the connection between upper and lower parts of the body and bear the most weight. Because of these roles, a person can easily hurts when lifting weights, stretches or turns after something.

The good news is that most back pain are gone in few weeks through a minimal care. Causes of lower back pain represents 60% of causes of degenerated intervertebral disc, at 20% of patients the complains are painful zigapofizal joints and about 20% of sacroiliac joint pain.

The success of therapy using medical knits is provided only by a diagnosis established with the greatest possible accuracy.

The orthotic corset is a medical device that provides correction, support or protection of the spine. Wearing the corset is aimed to prevent worsening of scoliotic curvature of the thoracic asymmetry and if it's possible improving statics.

Lumbar disc disease is the drying out of the spongy interior matrix of an intervertebral disc in the spine. Many physicians and patients use the term lumbar disc disease to encompass several different causes of back pain or sciatica. In this article, the term is used to describe a lumbar herniated disc.

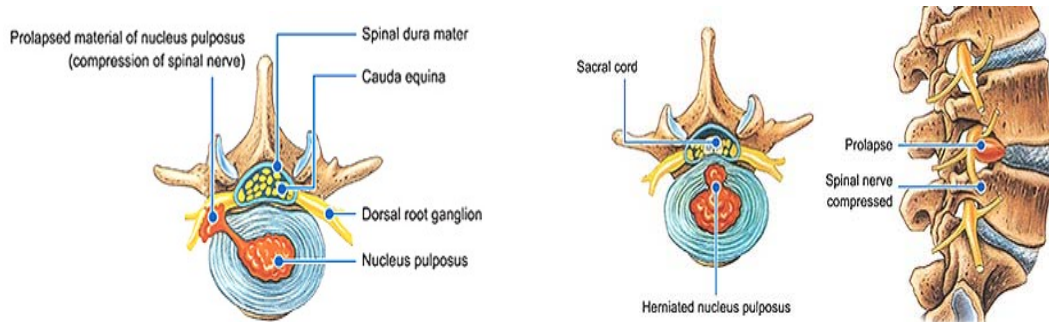


Figure 1. Herniated nucleus pulposus (disc), spinal nerves may be compressed laterally

It is thought that lumbar disc disease causes about one-third of all back pain. Initial treatment in lumbar disc disease is one or two days of bedrest and the wearing of orthotics.

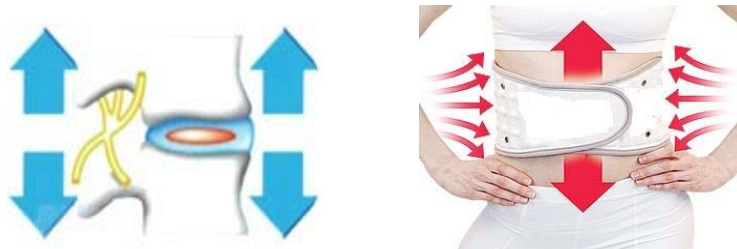


Figure 2. Disc disease solutions

Before treatment: The herniated or bulging intervertebral disc or herniated nucleus pulposus applies pressures on the nerve root, causing pain.

After treatment: Disc disease solutions helps resume the appropriate position of the intervertebral disc or nucleus pulposus by increasing the intervertebral space thereby reducing the pressure between lumbar/cervical vertebrae.

The goal of treatment with the knitted orthotics is to avoid severe degenerative lumbar diseases. Orthopedic assessment is crucial.

A elastic back brace (Fig.3) is a device designed to limit the motion of the spine in cases of fracture or in post-operative fusions. Limiting the motion of the spine enhances the healing process and minimizes the patient's discomfort.



Figure 3. Knitted back brace

The elasticated back brace offers compression and support without restricting movement. The two-way elasticated knitted fabric has been specifically designed to provide relief to injuries such as lower back pain, lumbago and rheumatic conditions.

The fabric is breathable, lightweight and follows the contours of the body, reducing the chance of slipping. It features an adjustable front closure for added comfort and fit, as well as an additional compression strap. Stays are provided in the rear, offering additional support.

This support can be used during a range of sporting activities including gymnastics and can be used at home or work.

3. Research related to new yarns to achievement for orthotics proposed

The yarns used to knitting the medical products for pressure therapies must possess certain properties which give to the product a certain value of use. Yarn properties are imposed on the raw material used and its structure. It is also necessary to know all of the properties underlying the assessment of yarns quality.

So it is proposed to achieve orthotics yarn of cotton core lycra. The yarn have 20tex finesse (finesse expressed in the system directly). Was chosen the combination of cotton with lycra for that after testing in the laboratory and compared with other combinations of yarns I concluded that the products are more effective, well tolerated and after wearing it get much better results. To achieve new types of products for pressure therapies I submitted research material that is found on figure 4.



Figure 4. Cotton yarn core lycra and the knitted sample with the yarn

Elastic yarns are those yarns that have property to recover shape and when it has distorted force ceased to act.

Core yarns are made of a core, usually with fibers. Elastic core yarns consist of: elastic core, building yarn from the first layer and building yarn from the second layer.

Elastic core yarns are also the most simple structures and the most complete, showing solidarity and association of elastic and non-elastic textiles. To obtain core yarns are using both natural wool yarn, cotton yarn and chemicals such as rayon, polyester, polyamide, in homogeneous or eterogene mixtures. To obtain knits, the yarn core promotes a better uniformity of the eye, thanks to a good torsion balances, high elasticity and nice touch. The knit is easy to maintain and does not change the appearance even after many washes.

The cotton yarn with lycra core has the same resistance to a higher fineness and greater comfort in wearing the lower hysteresis. Has the advantages the improved appearance and greater resistance to oxidation and light without the risk of aging, very comfortable wearing without losing compression, durability and elongation, very low sensitivity to chemicals. This yarn give quality to products like molding perfect without raising uncomfortable; stretching with every movement of the body, but at the elimination effort, the return to original form. Cotton Lycra core is a very good blend between the natural softness, quality and durability of cotton combined with elasticity and performance vitality of the Lycra yarn.

Knitted orthotics from this yarn, seamless, meet the requisite parameters are designed to provide a real increase sports performance and rehabilitation.

4. Experimental

For knitting the orthotics proposed I tested in laboratory the yarn and I got the necessary results. I tested the cotton yarn with lycra core on the dinamometer Tinius Olsen H5KT with cell power by 10N according ISO 2062. Measurement results are shown on tabel and strain diagrams under forces are shown on figures 5, 6, 7 and 8.

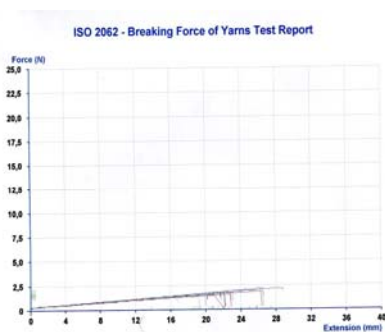


Figure.5 Strain diagram of dry yarn



Figure.6 Strain diagram of yarn in loop

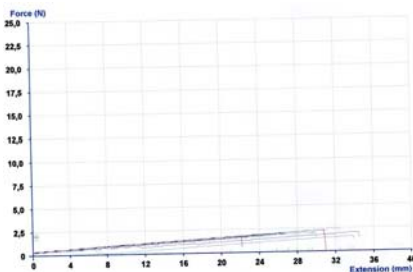


Figure 7. Strain diagram of yarn in knot

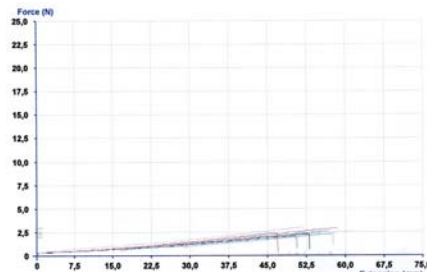


Figure 8. Strain diagram of wet yarn

Table 1. Mean forces values

Cotton yarn with lycra core	Breaking Strength N	Elongation %
Dry	1,670	4,233
Loop	3,758	4,923
Knot	2,028	5,76
Wet	2,473	10,64

The yarn was individually, in dry state, in loop, in knot and wet state applied to establish allowable values (table 1) for yarn tension during knitting.

Also I tested the various structure of knits and I designed the orthotic seamless, the knitted back brace (figure 9) on flat knitting machines with electronic selection and order of business software Stoll.

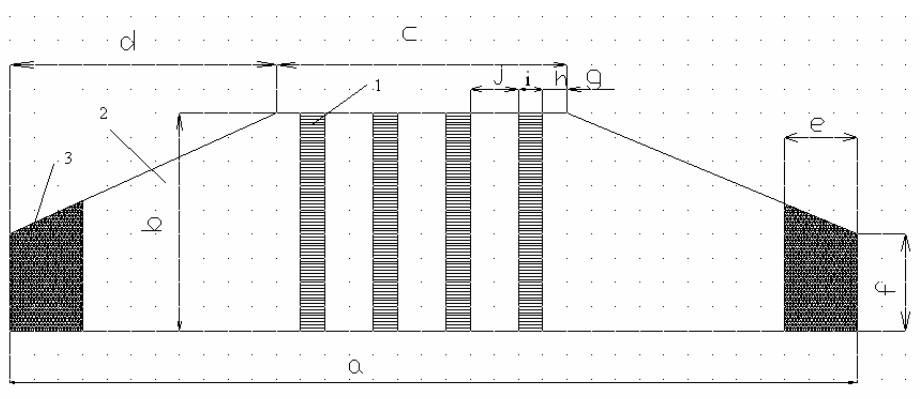


Figure 9. Knitted seamless corset
1-tubular single jersey , 2- jersey 1:1, 3- grip

The notations of figure varies depending on product size, their values can be found in table sizes of the product.

5. Conclusion

The main characteristics of knitted medical articles are easy application, quick attachment to different areas of the body, good support capacity and relatively low cost.

6. References

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