E CONF SERIES

International Conference on Medical Science, Medicine and Public Health
Hosted online from Jakarta, Indonesia
Website: econfseries.com 30th November, 2025

OPTIMIZATION OF TECHNOLOGY FOR SPECIAL CORSET PRODUCTS

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Abstract
This article examines the structural elements of special clothing, in particular, medical corsets, and their functional significance. At the center of attention are the seams, which are one of the main indicators of corset strength. Within the framework of the study, various types of seams - attachment, turn-over, overlock, and core seams - and their mechanical properties, depending on the type of yarn and stitch density, were experimentally evaluated. The results showed that the strength of the suture joints plays an important role in stabilizing the spine of the corset, reducing pain by restricting movement, as well as ensuring the operational durability of the corset and safe movement of the patient. The article also analyzes the possibilities of improving the functional and aesthetic quality of the corset and increasing production efficiency using modern sewing technologies and testing methods.

Keywords. special waist corset, sewing seams, attachment seam, basting seam, lamellae, mechanical durability, thread type, stitch density, medical and functional safety, operational durability

INTRODUCTION

The main task of special lumbar corsets is to maintain a stable position of the spine, reduce pain by restricting movement, and ensure optimal biomechanical conditions during the rehabilitation process. The effective performance of these functions is

directly related to the structural elements of the corset, in particular, the strength of the seams.

One of the indicators that determines the operational period of long-term use of special waist corsets is the strength of the joining seams of clothing parts[1]. Seam strength is the ability of seams to withstand mechanical stress and tension during the operation of clothing, as well as ensuring its durability and safety. The strength of connecting joints is the most important operational indicator of special clothing materials, since they are the main structural joints.

Breaking load is the main strength indicator that is taken into account when evaluating fabrics, which allows determining their durability, i.e., resistance to mechanical loads. Especially when resisting dynamic loads and bending forces arising during movement, the non-rupture, non-stretching, and non-deformation of the sutures is extremely important for the patient's safety.

Corset seams:

• Maintains the supporting lamellae in a stable position,
• Prevents displacement between the outer and inner layers,
• Can withstand stretching loads that occur during dressing and movement,
• Ensures long-term use of the product.

Therefore, the strength of the seam is assessed not only as a technological quality indicator, but also as an important guarantee of the medical and functional safety and reliability of the special waist corset. Experimental work was carried out to develop the technological processes of the special waist corset developed and recommended within the framework of our research. In the design of this corset, there are semi-rigid lamellae that support the shape, which perform the function of maintaining a stable physiological state of the spine and limiting movement. Therefore, external mechanical forces acting on the corset, especially loads directed to the lumbar region, create significant pressure on the seams.

In such conditions, a sufficient degree of mechanical resistance of the sutures - that is, the ability to resist tension, tear, and deformation - ensures the overall stability of the corset, support function, and safe patient movement. Also, the reliability of seams during long-term use is crucial in preventing changes in the placement of

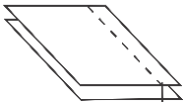
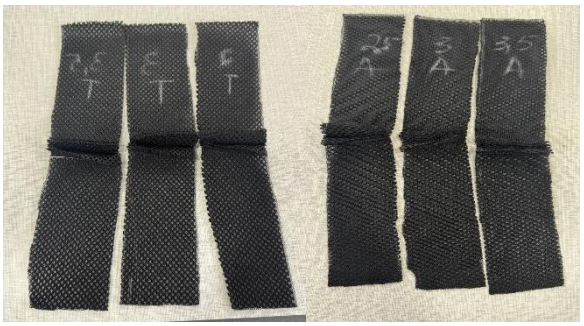
lamellae, preserving the integrity of the structure between parts, and ensuring the correspondence of the corset to the anatomical shape.

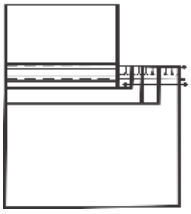
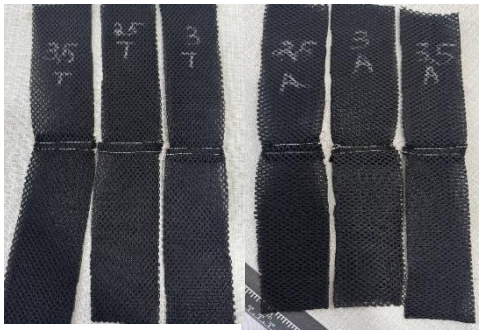
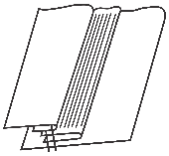
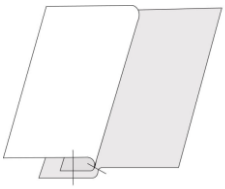
EXPERIMENTAL PART

Therefore, taking into account that most of the mechanical loads coming to the corset pass through the seams, the optimal thread number, stitch density, and types of seams for sewing operations were selected, and their strength was assessed on special testing equipment.

Figure 1. YG026T Breaking Force Machine

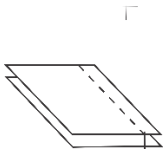
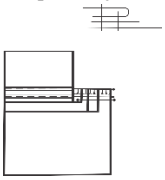
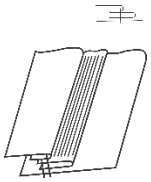
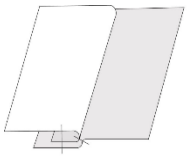
Table 1 Methodology for determining the strength of seams according to GOST 28073-89 [2].

Seam name	Picture
Joining seam 	

2.Cokette joining seam 	
3.Sugar attachment seam 	
4. Covering seam 	

The materials used in the design of special corsets and the strength of their joints directly affect the safety and reliability of the garment. The GOST 28073-89 standard defines the method for determining the strength of seams, which is of great importance in the development of special clothing and quality control (Table 1).

Table 2. Strength characteristics of special corset thread connections

Special corset fabric	Thread, number	Stitch row, mm	Breaking load, N							
			Types of seams							
			Option 1 Joining seam 		Option 2 Coquetted joint seam 		Option 3 Cantilever joint 		Option 4 Surface seam 	
			Frame	Weft	Frame	Weft	Frame	Weft	Frame	Weft
	40/2 40/2 30/2	2,5 3,0 3,5	164,4	168,6	462,3	496,6	231,8	328,6	448,8	412,6
			142,9	156,3	497,3	435,8	208,2	296,6	497,3	432,3
			128,4	158,8	556,8	572,3	166,6	248,2	558,8	571,3

The location, type, and number of seams used significantly affect their strength. The results of the conducted research showed that the seams made using yarn No. 30 had significantly higher strength compared to yarn No. 40.

It was established that the strength indicators of the fastening and overlock seams were especially high when performed in a 2.5 stitch row compared to the rest of the seams. This circumstance indicates that with a suitable choice of the shape of the seam and the number of stitches in the seam structure, the seam will be more resistant to tearing during the tests (Table 2).

RESULTS AND DISCUSSION

According to the results obtained, the highest indicators were determined by the strength of the seam of the yokette joint. However, in the process of comparison, it was established that one of the most common seams in corset sewing technology are "joint" and "overlapping" seams, and from a practical point of view, it is advisable to use these seams. In the process of manufacturing the medical waist corset, several types of joints were used in a complex - joining, folding, pressing, and core joints -

in order to secure the parts, stabilize the shape, and ensure operational strength. Each type of seam was selected according to its technological and functional purpose, which directly affects the overall quality indicators of the corset.

With the help of fastening seams, the outer and inner layers of the corset, as well as the main structural parts of the back pieces, were fastened. This type of seam serves to uniformly join the fabric layers, prevent displacement, and maintain dimensional stability of the structure. Since the pressure distribution in medical corsets, especially in the lumbar and sacral regions, should be uniform, the suture density of the joints should be maintained within 2.5-3.0 mm.

Turning seams are used on the front panel and side parts of the corset, improving the aesthetic appearance of the garment and softening the direct contact of the seam areas with the skin. This method increases the patient's comfort, reduces skin irritation during prolonged wear, and ensures hygienic safety.

Covering seams are one of the most important elements of a corset. They are sewn vertically along parallel lines in the zones of supporting lamellae (semi-rigid plates). This arrangement prevents displacement, deformation, or bending of the lamellae. During the research, it was experimentally determined that yarn No. 30 was the most optimal option for overlock seams, showing high results in terms of tensile strength, elasticity, and mechanical strength [3].

Core seams were used to reinforce the outer edges of the corset. This type of seam reinforces the overall shape of the structure, prevents deformation, and creates clean, smooth lines in the seam areas of the corset. Especially in the sacral and lateral areas, the use of core sutures increases the aesthetic appearance and durability of the product.

All stages of sewing the medical waist corset - placement of parts, fastening of lamellae, seam processing, as well as heat and moisture treatment (pressing and ironing) - were carried out according to the technical diagrams developed in the CLO program. With the help of this program, the direction of the seam, the seam density, and the placement of layers were visually determined and tested in a virtual environment.

As a result, the developed technological solution increased the mechanical strength of the corset by 25-30%, completely eliminated the displacement of lamellae, and

extended the service life of the finished product by 1.5-2 times. This solution also made it possible to reduce fabric losses in the production process by 8-10% and reduce sewing time by 15%.

Thus, the developed sewing technology is recommended as an important technological solution that ensures the functional safety, aesthetic quality, and production efficiency of the medical waist corset.

REFERENCES

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