Compression Hosiery

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Physical properties of Fiber Forming Polymers, Fibers and Fibrous Structures

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Leg Ailments Which Lead to the Need for Compression Hosiery

Compression, regarded as one of the most important functions in the healing process (Oess, 2004) serves a wide array of people, as there are many reasons why one may need compression hosiery. Chronic venous insufficiency (CVI), which is characterized by symptoms including: oedema, hyperpigmentations, lipodermatosclerosis, white atrophy, and ulcers on the leg (Neumann 1998 as cited in Van Geest, Franken, Neumann 2003), is a serious condition that can be controlled with compression hosiery. The contracting and relaxing of the calf muscle during normal walking provides the power necessary to drive blood back up the leg and ultimately to the heart. Backflow of the blood is prevented by valves found in veins. The rate at which venous blood returns up the leg is an indicator of how well the valves are functioning, as the rate will be significantly slower when the valves are not competent (Pah-Lavan, Hampton, 2004). When these valves are damaged, or become inept (Figure 1), at stopping the backflow of blood pressure on the venous system is increased, and further valve incompetence may occur and thus increased pressure in the veins, and can ultimately lead to a myriad of complications. Valve damage is when the valve cusps no longer meet, either they are damaged or have completely collapsed. (Johnson, 2002). In CVI, the pump in the calf muscle is not able to reduce venous pressure during walking, this increased pressure, commonly referred to as venous hypertension, ultimately leads to increased capillary pressure (Van Geest, Franken, Neumann, 2003).

The severity of CVI can be classified by the internationally accepted CEAP classification system. This system considers clinical presentation, aetiology, anatomy, and pathophysiological aspects of the situation. Patients who suffer from non-venous oedema such as decompensatio cordis or hypalbuminemia may also benefit from compression hosiery, as the compression exerted from the hosiery can reduce swelling. Van Geest et al. (2003) have determined that
arterial insufficiency is the most important contraindication for compression therapy, while other contraindications for compression therapy include: “acute deep vein thrombosis without sufficient collaterals, severe congestive heart disease, contact allergy to components of the materials used in stockings or bandages and undefined ulcers, such as carcinoma cutis” as determined by Neumann (1996, 1998 as cited Van Geest, Franken, Neumann, 2003).

Figure 1: Normal vein valves vs. damaged vein valves.


Unfortunately, due to low patient compliance in compression therapy, venous stasis ulcers often recur. As a chronic condition, leg ulcers can develop into DVT (deep vein thrombosis), a life threatening condition. For frequent travelers, economy class syndrome, commonly referred to as ECS is similar to DVT and is the result of blood clots formed while spending extended periods of time sitting in cramped positions as is common with economy class travelers. This combined with the lack of exercise and possible dehydration impairs venous
return and exemplifies Virchow’s triad, which indicates that damage to veins, reduced venous flow, and increased coagulation can cause thrombosis (Figure 2).

![Figure 2: Virchow’s triad](image)


Various studies, which have been supported by the American Academy of Phlebology and the American Heart Association among others, have linked ECS with both in-flight and post-flight deaths, and it has been suggested that the length of the flight is a key factor in the development of DVT (Ewing, 2005). Standing for long periods of time can also result in varicose veins and other circulation problems in the leg. Pregnant women, men and women who complain about having “tired, heavy” legs, people who have just had cosmetic surgery, burn victims, and sportspeople have all found uses for compression hosiery (Oess, 2004).
Varicose veins, often attributed to a hereditary vein weakness, are an early sign of venous insufficiency. An increase in pressure resulting from long periods of standing or exertion or a decrease in support from the tissues surrounding the veins can lead to varicose veins. Pregnant, obese, and elderly people are more susceptible to this increase in pressure than others. At this stage the use of compression hosiery is ideal as it can prevent the condition from worsening. (Pah-Lavan, Hampton, 2004). A 2003 study found that compression hosiery has similar effects, in regard to the rate of healing and the quality of life for patients, as superficial venous surgery. (Guest et al., 2003 as cited in Pah-Lavan, Hampton, 2004).

Haemosiderin is a permanent brown stain on the skin resulting from veins which have been stretched under high pressure and have allowed red blood cells to pass into the tissues. Iron from the red blood cells then deposits on the tissues and results in skin staining. Atrophy blanche are small white patches of bloodless tissue which are painful and a warning sign to venous ulceration. (Pah-Lavan, Hampton, 2004).

Finally, compression hosiery can also be utilized by second- and third-degree burn victims in preventing and treating hypertrophic scars and keloids and when treating contractures and joint deformations. (Wienert, 2003). Compression hosiery can facilitate in more rapid healing of burn wounds and the resultant scars have been found to be flatter and softer than without the treatment (Larson et al, 1971 as cited in Wienert, 2003).
Types of Compression Hosiery

Compression hosiery is also termed “medical elastic compression stockings” (MECS). MECS are considered to be part of phase 2 in a two phase compression therapy regimen. Phase 1 is for the reduction of the oedema and/or healing of leg ulcers via non elastic bandages, and phase 2 is the maintenance of compression via MECS. The CEN (European Committee for Standardization) has distinguished four classes of graduated compression hosiery, which are based on the amount on pressure exerted at the B-level (ankle) (Table 1).

<table>
<thead>
<tr>
<th>Class</th>
<th>Pressure at ankle (mmHg)</th>
</tr>
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<tbody>
<tr>
<td>I</td>
<td>15-21</td>
</tr>
<tr>
<td>II</td>
<td>23-32</td>
</tr>
<tr>
<td>III</td>
<td>34-46</td>
</tr>
<tr>
<td>IV</td>
<td>$\geq 49$</td>
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Table 1: Classes of compression hosiery and corresponding maximum pressure (at ankle)

Note: mmHg is the pressure measured in millimeters of mercury

**Class I (mild):** Exerts pressure ranging from 15-21 mmHg at the ankle and is useful as thrombosis prophylaxis, pregnant women may also utilize hosiery from this class, but as this compression is considered to be minimal it has no other medical uses (Van Geest et al., 2003).

**Class II (moderate):** Exerts pressure ranging from 23-32 mmHg at the ankle and is useful in light oedema in CVI, after sclerotherapy, in case of dependency oedema, and in varicosity without oedema (Van Geest et al., 2003).
**Class III (strong):** Exerts pressure ranging from 34-46 mmHg and is useful for those with a moderate to strong tendency to form oedema in CVI, varicosity with oedema, after venous ulcer healing, after erysipelas, and in post-thrombotic syndrome (Van Geest et al., 2003).

**Class IV (very strong):** Exerts pressure from 49 mmHg and above, and is useful mainly in lymphoedema and elephantiasis.

**Custom:** This compression hosiery can be made at any compression setting, and is generally bought by patients requiring class IV compression hosiery. Also, patients who may have atypical limb sizes may require custom hosiery.

Often, a patient may find it quite difficult to put on Class III or Class IV stockings, in this case, it should be recommended that the patient wear two layers of compression hosiery, since the resultant compression can add up to the class compression that was initially prescribed.

A pressure profile (Figure 3) shows how the pressure changes as it moves up from the ankle to the top of the thigh. Compression hosiery always exerts the most pressure at the ankle and exerts progressively less pressure as it moves up the leg to the hip, or wherever the hosiery stops which may be the knee, or thigh. When measuring for compression hosiery the patient should be oedema free and in the supine position. Measuring should be taken at the specific measuring points (Figure 4), which are in compliance with CEN, from the ankle to the top of the thigh (A through G). As the length of a stocking will vary for different types of therapy, only the appropriate measurements need to be taken. Deep venous leg thrombosis and lymphoedema
usually require measurements from A-G, while CVI may only require measurements from a through D.

Figure 3: Pressure profile for compression hosiery. The maximum amount of pressure is exerted at the ankle. In the graph the solid line is the ideal pressure profile.

Figure 4: Specific points where measurements should be taken to determine a hosiery size for a patient, or if custom hosiery is required.

Construction and Materials of Compression Hosiery

MECS can be constructed in two different ways, flat knitted stockings and round knitted stockings, each has different advantages and disadvantages for the patient, along with different compression properties. “All MECS should have closed, and knitted, heels with the appropriate anatomical form and stretch qualities”. (Neumann, 2000 as cited in Van Geest, Franken, Neumann, 2003).

Flat Knitted Stockings: This type of compression hosiery has a seam, and can come in standard sizes or be custom made. The flat knitted stockings, while not as cosmetically appealing, generally have a better fit than the round knitted stockings, and are able to provide more precise pressure. “This is achieved by knitting a sort of loops without influencing the tension of the threads. Sewing the sides together and making a seam finishes the stocking” (Neumann, 1996 as cited in Van Geest, Franken, Neumann 2003). These stockings “have elastic threads or inlaid elastic and knitted elastic threads. The inlaid thread should occur at least every second course”. If inlaid threads are not utilized then a “minimum linear density of 156 dtex in at least every other course should be used” (Neumann, 2000 as cited in Van Geest, Franken, Neumann, 2003). The shape of this type of hosiery can be changed by changing the number of needles used in knitting. This type of hosiery is more flexible, and thus donning is not difficult.

Round Knitted Stockings: This type of compression hosiery does not have a seam, is usually thinner than flat knitted stockings, and can come in standard sizes or be custom made. These attributes are what make the round knitted stockings a favorite for patients. “During manufacture the size is made by changing the tension of the threads. Therefore, the pressure produced by the round knitted stockings will never be as precise as that of the flat knitted stockings” (Neumann, 1996 as cited in Van Geest, Franken, Neumann, 2003). These stockings
“have elastic threads or inlaid elastic and knitted elastic threads. The inlaid thread should occur at least every second course”. If inlaid threads are not utilized then a “minimum linear density of 156 dtex in at least every [other] course should be used” (Neumann, 2000 as cited in Van Geest, Franken, Neumann, 2003). The shape of this type of hosiery can be changed by changing the tightness of the courses and the tension of the knitted threads (Neumann, 2000 as cited in Van Geest, Franken, Neumann, 2003). Donning in this type of hosiery, due to the lack of stretch, is generally quite difficult.

Net stockings are also available, cut out of a net fabric and seamed, patients find these to be the least aesthetically pleasing. These are only available as custom made hosiery. One-way stretch stockings are another form of custom made compression hosiery. This hosiery is constructed in a similar way to round knitted stockings, but is of a significantly heavier material. Styles of compression hosiery include knee high, thigh high, and full length, for men and women and maternity styles for women during pregnancy. For stockings that come below the knee, open and closed toe options are available. Currently, there is no evidence to suggest that one style is more effective than another style. (Johnson, 2002).

Compression hosiery usually contains two types of yarns. High-strength yarns, ranging from 310dtex to 1,880 dtex, are inlaid and provide the necessary pressure and elasticity to be considered a medical product while finer elastic and non-elastic yarns form the weave and covering layer of the hosiery (Figure 5).
Figure 5: Diagram of the construction of the in-laid yarns for compression and knitted yarns for stitch forming in compression hosiery.


The inlaid yarns are also responsible for the comfort level of the hosiery, as that is the layer touching the skin. Together, these yarns generally consist of approximately 85% polyamide, 10% cotton, and 5% other materials such as multifilament fibers or microfibers such as Tactel® for suppleness. (Oess, 2004). The polymide, Supplex®, if often utilized in compression hosiery as it looks and feels similar to cotton, but dries faster, has better colorfastness, and offers better abrasion resistance than cotton. Supplex® also does not support bacteria growth as cotton, a natural cellulosic fiber, is very susceptible to bacteria such as mold. Elastane fibers have replaced the use of rubber in compression hosiery and offer such benefits including more precise compression, resistance to oxidation by UV rays, ointments, and body fats, higher comfort levels (less restricting), easier donning, constant strength and compression over various conditions, and overall improved fit. Elastane yarns are finer, have better hysteresis properties (last longer), and do not cause latex allergies. (Oess, 2004).

Other materials found in compression hosiery that add to its appeal include a silicone blend which makes the fabric more slippery, and thus easier to put on. Microfibers, such as
Tactel®, and multi-fiber yarns attribute to the physical aspects of the hosiery including breathability, coolness, comfort, and correct sizing. Coolmax®, a synthetic fiber with a four-channel cross-section, has the capability of conducting sweat and moisture away from the body via a capillary action and to the outer surface of the hosiery where it can evaporate and thus keeps the patient’s body temperature regulated. Tactel® also offers similar benefits to patients. (Oess, 2004). Specialty flat nylon 6 monofilament yarns, with a dtex of 17 and 22, have a high tenacity value, while the properties of spandex allow the hosiery to stretch and recover. All of these aspects of the yarns utilized in compression hosiery provide increased comfort, which is especially important for long term wearing, a superior fit, and a more aesthetically pleasing garment. (BSN-JOBST, p.8) Salzmann, a compression hosiery manufacturer uses the following formula for their hosiery: 40% Tactel®, 30% Lycra, 20% cotton, and 10% X-Static® (a silver fiber). (Hosiery Handles the Pressure, 2002).
How Compression Hosiery Works and When it is Used

Compression therapy is a form of healing that has been utilized since the time of Hippocrates (450-350 BCE) and has been documented throughout the centuries as therapy for treating such ailments as varicose veins and leg ulcers. Upon the discovery of rubber, and the ability to coat “rubber threads with other types of threads” (Van Geest et al., 2003) an array of compression hosiery, with varying degrees of compression, could begin to be developed. Compression therapy can be used “in support of surgical treatment of varicose veins or sclerocompression therapy [or as] maintenance therapy in patients after a venous leg ulcer has healed or for example, lymphoedema” (Van Geest, et al., 2003), but the optimal grade of compression required to prevent reulceration is not yet known (Nelson et al., 2006). It has been proven through clinical trials that compression hosiery can also reduce thromboembolic disease.

The working mechanism of compression therapy, and thus compression hosiery, is resultant from the pressure exerted on the leg. As an external application which applies compression to the skin in order to support the superficial venous system, this pressure forces a portion of the veins to narrow while the other portion completely closes. As a result, there is a reduction in the volume of blood in the veins, and the calf muscle pump can work better and the bloodstream is more easily able to move up toward the heart, and thus there is higher tissue oxygenation and better micro circulation (Van Geest, et al., 2003).

Van Geest et al. (2003) state that compression hosiery can be utilized as a short-term treatment, although there are many other sources that state otherwise. Studies have shown that upon removal of the hosiery, reversal of the underlying disease, such as valve repair or improvement in calf muscle function, is not apparent. (Ruckley, 1992 as cited in Johnson, 2002).
Due to the high recurrence rate in leg ulcers and other leg ailments compression hosiery has been deemed a lifelong treatment option.

Compression hosiery actively, with its limited stretch, exerts pressure under all circumstances; this includes the supine position when the patient is lying down, or sitting. Therefore compression hosiery should be removed at night and put back on immediately upon waking in the morning, so as to avoid any complications with the arterial influx (Callam, Ruckley, Dale, Harper, 1987 as cited in Van Geest, Franken, Neumann 2003). The pressure being greatest at the ankle increases blood velocity in the venous system. With this increased blood circulation there is relief from swelling and other associated leg ailments.
Performance (Laboratory vs. Consumer)

Compression hosiery must be tested and meet standard requirements. The CEN has specified both requirements that compression hosiery must meet in order to be deemed a medical elastic compression stocking, and test methods that should be utilized to rate the stockings.

The elasticity and elasticity coefficient (EC) tests determine the elasticity of the rubber utilized in the compression hosiery. Since the pressure exerted by an elastic yarn, in this case the compression hosiery is related to that yarn’s extension capabilities “implies that there is a relationship between the pressure exerted by the circumference of the non-extended stocking and the circumference of the leg” (Van Geest et al., 2003). The importance of this test comes from the fact that the circumference of the leg will increase during normal activities, such as walking; therefore the pressure of the hosiery should also increase. This swelling / pressure result is directly related to the elasticity coefficient of the yarns utilized in compression hosiery. The elasticity characteristics of compression hosiery are also commonly referred to as “stiffness or slope value”, which shows that as the circumference increases the pressure yielded on that circumference will also increase (Figure 6) (Van Geest, Veraart, Nelemans, Neumann, 2000).
The stiffness (S) slope can be calculated with the following equation:

\[ S = \frac{(P_{+1} - P_{-1})}{2} \text{hPa/cm (mm Hg/cm)} \]

\[ P = \text{pressure} \]

\[ P_{+1}/P_{-1} = \text{girth at the B-level when it increases/ decreases by 1cm} \]

Figure 6: Pressure-circumference relation: stocking I has a high elasticity coefficient (EC), stocking II has a low EC.


A higher S value indicates that the hosiery is more capable of preventing oedema because it exerts more pressure, though it will likely be more difficult to put on by the patient. As the numbers increase so does the class (I-IV) of the stockings.

Another aspect that must be accounted for in compression hosiery is hysteresis. “Hysteresis is the loss of recovered linear length of an elastic product when it returns after
exposure to repeated stress-relaxation cycles” (Gardon-Mollard, Ramelet, 1999 as cited in Van Geest, Franken, Neumann, 2003). Although the elastic in compression hosiery will never completely return to its initial state after is has been stretched (i.e. worn), it should recover well enough to deem the product durable, as it is recommended that compression hosiery should be replaced every three to six months. The hysteresis curve will show how much the elastic utilized will deform and recover after repeated stress-relaxation cycles in testing.

Other tests that compression hosiery manufacturers may choose to conduct include the HATRA test (ASTM-D4031-1981). This test determines the bulking potential of texturized yarns and can be utilized to determine accurate compression in hosiery. The Donning test is utilized to determine how easily a patient will be able to put on his or her hosiery. Many elderly, and arthritic patients have problems with dexterity, and thus many donning aids are available. The Ball Burst test (ASTM-D6797), is used to determine how much force is required to rupture a fabric, this is important for compression hosiery because if force exerted by the leg exceeds that which the hosiery can withstand the hosiery will tear. The abrasion test (ASTM-D 4158-08) measures durability, as compression hosiery is worn for extended periods of time it should be durable enough to withstand a certain amount of abrasion. The Moisture Absorbency test can measure the hosiery’s ability to wick water away from the feet, this is important in regard to hygiene and comfort. Photoimage Analysis is a way for manufacturers to evaluate the sheerness and breathability in the hosiery. (BSN-JOBST, p.4)

While tests can be conducted in the laboratory to determine certain properties of compression and ensure that it meets or exceeds different standards and requirements it is when the patients are observed that is real test. In a 2006 a study was conducted at the University of Leeds in the United Kingdom by Nelson et al.. Over a five year period, 300 patients were
observed who were outpatients with recently healed venous ulcers, and no significant sign of arterial disease, rheumatoid disease, or diabetes mellitus. Nelson et al. found that compression hosiery did not significantly show a decrease in recurring venous ulcers. Of the 300 outpatients, 36% (107 patients) had experienced recurring ulcers. Although, it is noted in the results that the patients who used class III stockings “had the lowest risk of reulceration, but this risk was not statistically significantly different from the remainder of patients in both class II and class III” (Nelson et al., 2006) (Figure 7). Therefore patients should wear the highest level of compression hosiery is comfortable and that they can tolerate. (Nelson et al., 2006)

![Figure 7: Results of Nelson et al. study. A survival curve showing time recurrence in class II and class III compression hosiery.](image)


The study also found that recurrence was more likely with patient who had more previous ulcers, poor ankle movement, lipodermasclerosis, and an ankle-brachial pressure index
between 0.8 and 1.0 (as opposed to 1.0). Although a higher grade of compression hosiery has been found to be more beneficial and more effective in regard to preventing the recurrence of venous ulcers, it may result in noncompliance with patients. Studies have shown that noncompliance in regard to wearing compression hosiery has an increased risk of venous ulcer recurrence (Franks et al., 1995 as cited in Nelson et al., 2006). The higher pressure exerted in higher class hosiery, may, after a period of time, be intolerable for patients, and ultimately lead to noncompliance. In this case, if it is deemed necessary, it may be recommended that the patient wear two layers of the lower class hosiery instead of one high grade compression hosiery. The patient must be comfortable if he or she is to comply with his or her compression regimen.
Recent Developments

The incorporation of silver in compression hosiery is a relatively new benefit that is currently being researched. X-Static® is one brand that incorporates silver in textile fibers. The pure silver fiber is permanently bonded to the surface of the textile fiber. By bonding the silver to the fiber in this way the original textile and its tactile characteristics are maintained. Silver has many properties which can be considered advantageous to the patient wearing compression hosiery. These advantages include including: bacteria elimination from antimicrobial properties, anti-odor from its ability to neutralize body odors and inhibit the growth of bacteria and fungi, a 100% all-natural product that does not contain chemicals, anti-static effects from its high electrical conductivity, and less discomfort from its therapeutic properties. Thermodynamics is another benefit; the silver regulates temperature so the patient will be warmer in cool weather and cooler in warm weather. Conductive body heat can be dispersed and conducted away from the body while reflective body heat can come back to the skin. (X-Static: the silver fiber, [n.d.]).

Silver fibers in compression hosiery may potentially enhance the microcirculatory skin perfusion. In a study conducted in 2007 by Jaccard et al. at the University Hospital Basel in Basel Switzerland the benefits of silver in compression hosiery were confirmed. This small study observing only ten volunteers over the course of twenty-six days utilized Venosan® class II compression hosiery and Venson 5000® class II compression hosiery with interwoven silver threads. The results for the two types of hosiery showed significant differences (Figure 8); the regular compression resulted in compromising the nutritive capillary flow, whereas the addition of silver threads seemed to induce a redistribution of blood volume from deeper lying vascular structures towards nutritive capillaries with a positive net balance, regarding the nutritive perfusion. (Jaccard, 2007).
Figure 8: Results from twenty-six day study to see the effects of silver threads in compression hosiery. Shown is the change in tcpO$_2$ at 44°C.


While the regular compression hosiery did increase the tcpO$_2$ values, it was the silver threaded hosiery that brought the results into the positive range. This study provides initial evidence that silver threaded compression hosiery is superior to fabrics used for regular compression hosiery. The silver threaded hosiery is speculated to induce a Joule effect which would have the consequence of decreasing the viscosity of blood. There is currently no definitive research on this potential risk of silver in textiles.

Currently, there is research being conducted in regard to smart textiles being incorporated into compression hosiery. This new technology, still in its early stages of development, will incorporate sensors in the fabric that can monitor a patient’s blood pressure and if the patient is considered to be in a “danger zone” the fabric can work to massage the leg to bring the blood
pressure back to a normal level. A product such as this would be extremely beneficial to people who suffer from diabetes, and could potentially save lives. These “activated fibers” are a new wave in textiles, and initial research, tests, and experiments are presently being conducted so as to move these products to market as soon as possible. The University of Pisa in Italy has been conducting significant research in regard to smart textiles in compression hosiery. (B. Godfrey, personal communication, December 1, 2008).

Compression hosiery manufacturers such as Kendall have patented such aspects as an interrupted band and a functional gusset so as to reduce stockings from slipping and bunching around the knees and ankles without constricting circulation (Medical Hosiery Line of an American Giant, 2002). Customized compression hosiery has also become more prevalent as improper fittings of the standard sizes for many patients is not sufficient, while waist high, custom made stockings may reach up to $500 a pair generally patients still prefer this to bandage compression therapy (Ewing, 2005).
Fashion in Compression Hosiery

Today’s consumers want compression hosiery that looks good, feels good, is of good quality, and will provide the medical benefits necessary for their health. (Oess, 2004). While it is not a completely new idea, support pantyhose for men is a sector of the compression hosiery industry that is becoming increasingly more accepted. Men have been wearing compression socks in varying lengths for a number of years, but actual hosiery has been thus far unprecedented. The hosiery producer, G. Lieberman and Sons, which formally only produced women’s hosiery, has recently become a producer of men’s hosiery as well. As the threat of the potentially fatal DVT men, especially those who are require to fly often or on long flights, or spend most of their time standing are prime candidates for compression hosiery are even in the United States more men are accepting and utilizing full compression hosiery (“Support Pantyhose for Men”, 2002).

Formally, compression hosiery was only available in black, white, and beige, but can now be found in an array of styles, colors, and advanced features for both men and women (Figure 9). As compression hosiery looks quite similar to regular hosiery it is considered to be more aesthetically pleasing than the bandages associated with early compression therapy and is also significantly more comfortable it has become the method of choice for both doctors and patients when planning long term compression therapy. The hosiery can be worn on a daily basis (it is suggested that the patient own multiple pairs so that as one is being worn the other is being laundered) and will not adversely affect the patients’ lifestyle (Ewing, 2005).
Fashionable compression hosiery is desired by many patients, and the Italian company, Calzifici Riuniti Elli offers just that. The company brands in hosiery “Elly” and within its Fantasy line of compression hosiery trendy hosiery, that offers light compression (13-17 mmHg), can be found (Figure 10). It also offers a Classic and Thermal line of compression hosiery among others. This hosiery is marketed under in the anti-stress collection of hosiery (Antistress: Linea Fantasy, [n.d.]). Calzifici Riuniti Elli claims its hosiery is knitted with a difference, noting three areas of compression with the 100% compression starting at the ankle and decreasing as it moves up the leg, while this may be a novelty for fashion hosiery, all compression hosiery is knitted on this pressure gradient. The company states that it is this construction that “gives a special massaging effect…with beneficial effects on blood circulation”. The company also boasts of a maternity collection (Compression with Style, 2004).
Lycra also has its place in the compression hosiery market with its “Body Care” by Lycra Massage. The massage effect that is marketed to consumers is found in the light compression hosiery, “LegCare” with Lycra and in the knee high socks termed, “Energising Socks” with Lycra. These two products offered by Invista (formally part of Dupont) “massage into the skin revitalizing substances containing vitamin E… and microsubstances from seaweed” to improve the hand of the fabric utilized (Invista Wellness Extras, 2003). The Lycra Leg Care mild compression hosiery, which feels and looks similar to traditional hosiery, claims to reduce fatigue, energize the legs, and keep the legs healthy through a “gentle massaging action” to increase blood circulation, which can ultimately have a positive effect on long term health. The hosiery, composed of fine Lycra yarns, can be found in a variety finishes including sheer, opaque, poudré, and shiny. (Lycra Does the Legwork, 1998). The Tactel® yarns utilized in this hosiery can achieve two-color mixtures, tone-in-tone mixtures, and refined black/color patterns (Oess, 2004).
References


