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Fulled red hose:
a grave find from Ravattula Ristimäki in south west Finland dated to the early 13th century

Abstract
Ristimäki (Cross Hill) inhumation cemetery in the Ravattula village in Kaarina in south west Finland dates to the Late Iron Age and Early Medieval Period (12th to 13th centuries). In addition to the cemetery, this site has the remains of the earliest known church in the country. In one woman's grave (41/2016), rich in textiles and 14C-dated likely to the early 13th century, the leg coverings of the deceased were interpreted as hose. In the grave, there were pieces of the leg parts of hose and their fastening braids. The fulled fabric was woven in twill probably from locally produced wool and dyed red with madder (*Rubia tinctorum* L.). Cultivated madder was an expensive imported product in Finland, and its use became more common only later in the Middle Ages. Red hose showed the influence of European medieval fashion, which is unique in Finnish textile material of this era.

Keywords
Burial textiles, costume, leg coverings, hose, dye analyses, fibre analyses, Late Iron Age, Middle Ages, Finland

Introduction
In south west Finland, Christianity became a more prominent religion around the year 1000 and the tradition of cremation burials changed to inhumation ones. The custom of burying individuals in full dress, occasionally with grave gifts, continued for 200 years. In the local chronology, the latest period of the Iron Age has been called the Crusade Period (about 1025 CE to 1200 CE). After this period, the Iron Age gave way to the Middle Ages. This transition period is of great interest in south west Finland because it sheds light on the Christianisation process of early society there (Purhonen 1998, 134; Hiekkanen 2010, 325–327, 340–341).
In Finland, the preservation of organic material such as bones and textiles is poor due to the acidity of soils. However, the preservation of animal fibres such as wool is better than vegetal fibres, especially in contact with metal, particularly those containing copper. Some wool garments were ornamented with small bronze spirals, and their oxides have prevented destructive microbes from growing. Textiles have usually been found in graves with abundant furnishings, and these grave finds reveal details about the clothing of the wealthier members of society (Lehtosalo-Hilander 1984, 2–4; Arponen 2008).
The best points of reference for excavated Finnish burial textiles can be found in the areas of modern day Estonia and Latvia. As early as the Late Iron Age, these areas were inhabited by Finnic and Baltic peoples such as Estonians, Livs and Latgallians. Common features in these people's dress were bronze spiral and ring decorations (Lehtosalo-Hilander 1984, 60–61; Bender Jørgensen 1992, 100; Riikonen 2005, 31–32; Rammo and Ratas 2016; Žeiere 2017, 117, 122).
The majority of the Finnish Late Iron Age archaeological textile finds are from women's graves, where the findings are concentrated around the chest and waist areas. Towards the foot of the grave, there has seldom been enough metal to preserve organic material. Aprons decorated with bronze spirals reached the wearers' calves, and underneath the hems of the aprons, there

Fig. 1: Ravattula church and Ravattula Ristimäki cemetery is located near Turku, in south west Finland (Image: Juha Ruohonen)

are sometimes the remains of a shinbone and textile. However, there are very few remains of leg coverings or shoes (Tomanterä 1982, 43–44; Lehtosalo-Hilander 1984, 4–5; Hirviluoto 1987, 14).

This paper presents an archaeological leg covering from the early 13th century grave (number 41/2016) excavated in the Ravattula Ristimäki inhumation cemetery and studied with microscopy in the conservation laboratory. Fibre identification was made with a transmitted light microscope. Dye analyses were performed by chromatographic method. The grave was abundant in textiles and these fragments were the sources for a reconstruction of the clothing. The deceased's outer garment and the leg coverings demonstrated a new European fashion influence, which is unique in the Finnish archaeological textile material of the medieval era.

The site: Ravattula Ristimäki

Ristimäki cemetery in Ravattula, in the town of Kaarina in southwest Finland, is known for the oldest known church remains in Finland (fig. 1). A wooden church was built at the site in the second half of the 12th century and it continued in use into the first half of the 13th century. The site, a low hillock of forest called Ristimäki (Cross Hill), is located next to the River Aurajoki, approximately four kilometres from the medieval cathedral of Turku (Åbo in Swedish), on the coast of the Baltic Sea. As part of a comprehensive study of this site by the Department of Archaeology at the University of Turku, part of the remains of a stone wall surrounding the area and 61 inhumations from a total of about 400 graves were excavated from 2010 to 2016 (Ruohonen 2017; 2019).

The earliest graves in Ravattula Ristimäki date from the beginning of the 12th century and the cemetery was in use until the first half of the 13th century, the Early Medieval Period (Ruohonen 2019) in local chronology. In Ristimäki, all the burials are classified as fully Christian or at least Christian-influenced based on the grave orientation and the overall lack of tools and weaponry, which were common grave gifts

in many other Late Iron Age sites (see Purhonen 1998, 133; Hiekkanen 2010, 340–341). Additionally, some individuals were buried fully dressed with metal items such as penannular brooches, belt buckles, knives, knife sheaths, and bronze spirals, whereas most of the excavated burials did not contain any artefacts, and in those cases, there was metal only in the iron nails of the coffins.

Textile fragments of both wool and vegetal fibre were found in 17 graves out of the 61 excavated in total, although most of the fragments were small and poorly preserved. Nevertheless, garments and accessories were identified in 12 burials (Kirkinen et al. 2020, 47). The female bodies were mainly clothed in peplos-style mantle dresses, well known from other crusade period cemeteries in south west Finland (Lehtosalo-Hilander 1984). The dress was complemented with an apron decorated with bronze spirals, and an undergarment made of vegetal fibre. The deceased was often covered with a shawl decorated with bronze spirals, and sometimes with headgear, and equipped with mittens made in a single needle looping technique.

Due to the acidic soil, bone was not preserved and most often there was only some tooth enamel or a discoloured soil layer suggesting the position of the deceased although human scalp hair was found in several of the Ristimäki women's graves (Kirkinen et al. 2020, 48–49).

Grave 41/2016

At the end of October 2016, grave 41 (TYA 933:853:1–26) was excavated north of the church. The find level of the body was at a depth of approximately 110 cm and it was largely covered by the remains of wool textiles. The bone material was very poorly preserved. The areas where the skull and feet were was only discernible by the difference in the colour of the soil and the number of roots compared to the surrounding earth.

The female in the grave measured 160 cm to 165 cm. She was buried in a 173 cm long and about 40 cm wide coffin with her arms folded on her waist. On her chest, there was a small penannular brooch made of silver (fig. 2). It was the only piece of jewellery found in the grave. The textile remains on the upper part of the body had survived in significantly worse condition than those towards the legs.

The AMS radiocarbon result (Ua-64904: 823+-29) dated the piece of wool leg covering to the late 12th or 13th centuries. The calibrated (calibration curve Intcal20: Reimer et al. 2020) result with 68.2% probability gave the years 1210 to 1265 calCE and with 95.4% probability the years 1170 to 1275 calCE (Bronk Ramsey 2005). Since the site was abandoned by the mid-13th century at the latest, it is possible to date the grave to the early 13th century.

The deceased was covered with a spiral decorated shawl but there was no evidence of any organic material underneath the furnishings. However, this does not necessarily mean that a lining or filling was completely absent from the coffin. The remnants of furs and feathers indicated the use of burial furnishings in many other Ristimäki graves (Kirkinen et al. 2020, 52–53). The pollen analysis revealed rye (*Secale*) pollen in the coffin (Pätsi 2019, 24, 29). This flowering rye reveals that the burial occurred in June.

Methodology

Grave 41/2016 was lifted as five blocks of soil (each about 40 x 30 cm) which comprised the area from the shoulders of the deceased to her calves. The surface

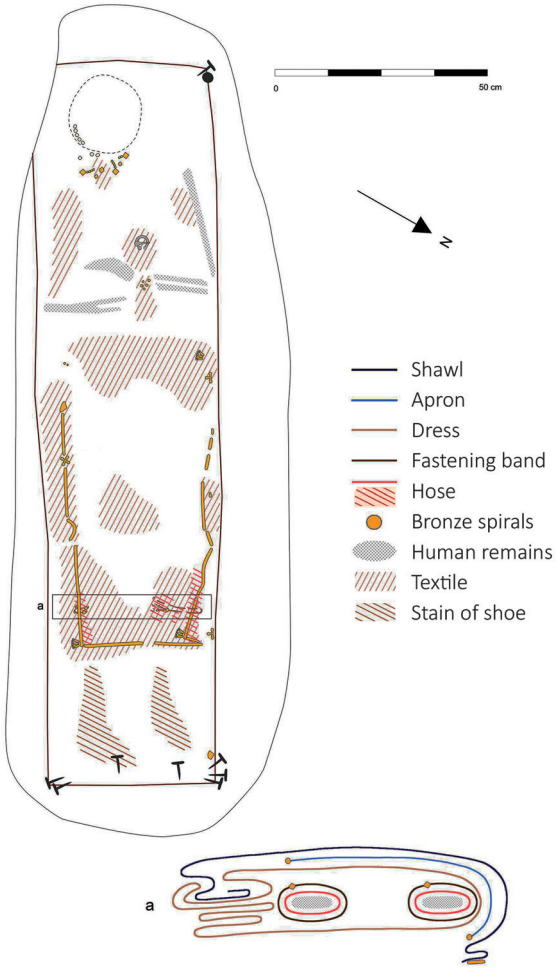

Fig. 2: Ravattula Ristimäki grave 41/2016 with a schematic cross section (Image: Siiri Tuomenoja and Jaana Riikonen)

of the block was moistened by sprinkling it with water. A thin plywood plate was pushed underneath and each block was wrapped in plastic before it was moved. The intact parts of the grave were X-rayed and frozen for future research.

The micro-stratigraphic excavation under a stereomicroscope took place in the conservation laboratory of the Museum Centre of Turku (*Turun museokeskus*) from 2017 to 2018. Sand and soil were removed with brushes, dental instruments, scalpels, and fine metal tweezers. Thin roots were growing through the folds of the fabric which looked like stitches. In some cases, they were cut with a scalpel and the folds of the fabric opened. The fabric pieces were straightened on plastic plates, another plate was set over them, and then they were dried slowly in a refrigerator. The wool textiles were not mineralised but when they dried, they were no longer elastic. The textiles became fragile, resembling old paper. Mechanical cleaning was the only conservation method used for the textiles.

The direction of the warp, binding, twist of the yarn, thread count, seams and other details of the textile were studied. The blocks were documented with digital photography and with 1:1 scale drawing on plastic sheets. All organic materials were sampled for identification. The excavated soil from the block, as well as soil samples taken in the field, were analysed for macrofossils and minuscule fibres. Samples for pollen analyses were taken from the find level of the blocks. Thread samples were taken from the textiles for fibre and dye analyses. The thread diameter was measured before the yarn was separated into fibres for the fibre analysis. Fibre identification was made with transmitted light microscopy. A total of 23 samples were collected for the chromatographic dye analysis performed by High Performance Liquid Chromatography and photo diode array detection system (HPLC-DAD).

Results

The body was clad in a wool dress on which the preserved part of the hem is about 160 cm wide. In the measured areas, the dress is more than 70 cm long and reaches the calves. A tablet-woven band was found between the dress folds. Leg coverings fastened with braid were found under the dress hem. An apron decorated with bronze spiral tubes situated low on the body was missing its ties, or they were not preserved. Parts of a spiral-decorated diagonally plaited braid on the body's neck and right shoulder belonged to a headband of the type known from other south west Finnish graves (Appelgren-Kivalo 1907, Tafel VII: 1, 2; X: 1a). A rectangular shawl about 150 cm in length covered the body from the shoulders to the feet. It was decorated with cross-shaped spiral ornaments and lined with a tubular tablet-woven band. A small silver penannular brooch located at the middle of the chest was broken, and two vegetal fibre tabby fragments a few millimetres in size were detected among the brooch pieces. The deceased probably wore a shirt made of plant fibre. The brooch was most likely fastened to a wool cloth, the function of which is still unknown.

All the fabric fragments found in the grave were made of wool and woven in 2/2 twill weave, apart from the tabby fragment. There are five different types of twill weaves, and they all have an S-plied warp and a Z-spun weft (Karisto et al. 2020). These types of fabric are typical in Finland from the Late Iron Age to the Early Middle Ages (Bender Jørgensen 1992, 99, 140). The fabric density is 10–12 threads per cm in the warp and 8–10 threads per cm in the weft of the dress; about 14/8–10 threads per cm in the apron; 12–14/9–11 threads per cm in the shawl; and 12/10–12 threads per cm in the unknown wool twill textile. Tubular selvedges were identifieded in the apron and shawl fabrics.

On the left side of the coffin, under the blue shawl and the blue apron (Vanden Berghe 2019, 25–26), there were several folds of fabric with the warp following the direction of the coffin. The cloth had four longitudinal flat-felled seams preserved, and the hem was probably made up of six fabric pieces of different widths (about 20–57 cm) sewn together. None of the pieces tapered upwards as is typically seen in medieval gowns with gores. Four hem edges had been turned onto the reverse side and hemmed, and simple starting borders fringed the other two pieces. Since the same fabric was also detected in the upper part of the grave, it was interpreted as a dress. The binding structure of the twill weave created a colour effect in the warp and weft: two light and two dark yarns alternate one after the other in the fabric. This type of fabric has been identified in only two other Finnish Iron Age burials situated a few kilometres apart along the River Aurajoki near Turku (Turku Kirkkomäki grave 1/1950, KM 12687:5; Turku Kurala Ristimäki grave VIII, KM 14349:99). The dress fabric in the Ravattula Ristimäki grave had been strengthened by darning near the hem edge, indicating that the dress had been worn. A fragment of a patterned tablet-woven band, 8 cm long, was most likely the waistband (Karisto et al. 2020, 6–8).

Fig. 3: Fulled twill wool and plaited tassel ends of the tablet-woven band on top of the right shin in Ristimäki grave 41/2016 (Image: Museum Centre of Turku/Riikka Saarinen)

Fig. 4: Fulled twill wool and patterned tablet-woven band under the right shin in Ristimäki grave 41/2016 (Image: Sue Salminen)

Fulled red fabric and tablet-woven bands

The X-ray image taken from the block of soil around the legs of the deceased revealed bronze spiral tubes at the edges of the apron, a spiral decoration on the shawl, and smaller spiral decorations. Under the remains of the shawl and apron was the dress fabric with several seams, and under it, attention was first focused on the right shin of the deceased. Here, there was fulled wool fabric and on top of it two decorative, tasselled band ends (TYA 933:853:21) (fig. 3). The whole object was turned upside down and under the shin two similar fragments of the 6 mm wide tablet-woven band were preserved nearly one on top of the other (fig. 4). The band was tied around the leg approximately 8 cm above the hem of the apron and the dress. There was fabric around the leg both above and below the band. The largest surviving piece of fabric is approximately 5 cm wide and 12 cm long. In small pieces of the fulled fabric there are holes which were possibly made by stiches (fig. 5) (Riikonen 2019, 175–176).

The leg covering is made in a 2/2 twill, but due to the fulling, the surface is fluffy, making the thread count impossible to measure. The decomposition of the textile and the small roots growing through the fabric also made the direction of the warp difficult to determine. It was possibly parallel to the shinbone. One of the yarns in the fulled fabric was S-plied of two z-spun strands, both with a tight twist and fluffy as is the case for carded wool yarn. This plied yarn is the warp, the weft was made of z-spun single yarn. The weft had an even higher twist and was thicker than the warp (Kirjavainen 2018, 6).

The fabric covering the left leg of the deceased (TYA 933:853:20) was not as well preserved as the right one but there was still an 18 cm long piece with what seemed like a diagonally cut top edge. A tablet-woven band that was only 3 mm wide went twice around the leg about 6 cm below the top edge (fig. 6). The fabric continued toward the foot for approximately 10 cm until it reached the spiral decorated hem of the apron. It is not known how far down the fabric would have continued below the apron hem. The distance between the hem of the apron and the feet of the deceased was about 20 cm (Riikonen 2019, 177).

The narrow tablet-woven bands are worked in three colours in the same pattern. A small, checked pattern was constructed with eight tablets using the threaded-in technique. A tubular selvedge woven with one tablet on both sides of this narrow band was recognised with support of the holes and impressions left by an inserted weft on both edges of the band. The ends of the bands were finished with two 20 mm long plaited tassels, which were elaborately decorated with bronze spirals (Karisto et al. 2020, 11; Karisto and Pasanen 2020, 74–97). After the fastening band was tied twice around the leg covering, the tassel ends of the band were arranged horizontally on the leg.

Fibre analyses

The results of the fibre analysis indicated that the quality of the wool in the textiles in grave 41/2016 fell between coarse and very coarse types. The yarns were spun from a wool type consisting of fine underwool and coarser fibres and guard hairs which may have originated from various individual sheep of local origin (Kirjavainen 2018). Both the wool and the resulting yarn had uneven features. Wool selecting, sorting, teasing, and spinning was in the hands of capable spinners who produced durable yarn despite the uneven and variable fibre material available (see Kirjavainen and Riikonen 2007a, 171).

None of the yarn in the fulled fabric had dead or kemp fibres. The fibre diameters varied between 20 μm and 100 μm. However, despite the wide range, the quality of the yarn was quite even (fig. 7). The yarns were spun from coarse or very coarse wool. It seems that when the fleece was sorted and treated, the coarsest fibres (around 80 μm to 100 μm in diameter) were pulled out because the fabric was destined for fulling and coarse fibres would stick out from the fulled fabric surface. Compared to the other fabrics in the grave, the fibres in the leg coverings were the finest and best sorted. The cloth resembles medieval fulled fabrics (*sarka* in Finnish) but its fibre distribution is much finer compared to the medieval ones (Kirjavainen 2018, 6–7; Karisto et al. 2020, 10). The wool is most likely local and the origin of the legwear was defined as domestic production. However, the exact origin of the wool or the sheep breed cannot be confirmed without extensive isotope and aDNA analyses.

Fig. 5: Fragments of fulled twill fabric of the right leg covering in Ristimäki grave 41/2016 with what may be stitch holes in the largest (Image: Jaana Riikonen)

Dye analyses

The fibres of the dress seemed to be reddish-brown under the transmitted-light microscope but, according to the dye analysis, this wool has its natural colour and the yarns were undyed (Vanden Berghe 2019, 24).

Traces of blue indigotin were found in the apron, shawl, and tablet-woven bands. Most probably, the source of dyestuff was woad (*Isatis tinctoria* L.) (Vanden Berghe 2019, 16, 25). Large-scale cultivation of woad flourished in central and western Europe from the 11th century onwards, and dried woad balls were imported to the Baltic Sea area, including Finland. The predominant colour in Iron Age textiles which have been analysed is blue (Peets 1998a, 307; 1998b, 289; Vajanto 2015, 56–58).

The yarn of the right leg band that looked blue contained indigotin; the yarn that looked yellow was undyed wool; and the brownish-red looking yarn had been dyed with madder (Vanden Berghe 2019, 25). Thus, the fastening band of the leg covering was blue, red, and white in colour.

The fibre sample of the fulled fabric had a clear red hue and the dye analysis showed that the yarn of the leg covering contained alizarin and purpurin, so it had been dyed with madder (*Rubia tinctorum* L.) (Vanden Berghe 2019, 17, 24). Cultivated madder gives a much richer shade of red than the madder species growing locally in the wild. Madder was professionally cultivated in central and western Europe and the red colour substance of the roots was a valuable product. Prehistoric textiles dyed with madder were very rare and most likely imported in Finland. Madder dyeing was not common until the Middle Ages (Kirjavainen 2002, 348, 350; Vajanto 2015, 51–52, 62).

Discussion

Foot and leg coverings in Late Iron Age Finland

Wearing fabric or leather legwear comprising separate parts for the leg and the foot is an ancient custom in Europe and was part of the folk costume of certain peripheral regions until quite recently. Several northern peoples used softened hay or pieces of

Fig. 6: Remains of fulled fabric and tablet-woven band on top of the left shin in Ristimäki grave 41/2016 (Image: Jaana Riikonen)

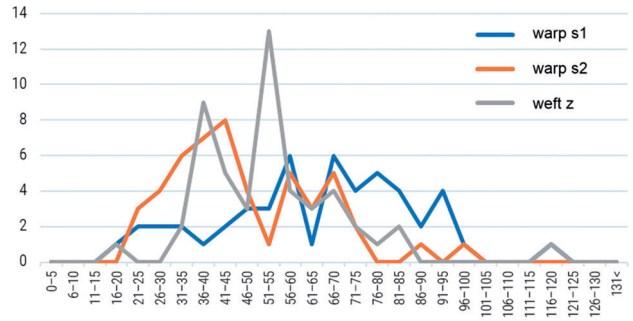

Fig. 7: The fibre distribution of the warp and weft yarns of the fulled red fabric. The Y-axis shows the number of measured fibres; the x-axis shows the cross section of fibres in micrometres (µm = 0.001 mm) (Image: Heini Kirjavainen)

fur with the hair turned inwards as protection and insulation inside their shoes during the winter (Sirelius 1916, 222–223; Itkonen 1948, 372–373; Kaukonen 1985, 94). However, although shoe hay may have been the choice for everyday use, the feet would probably have been covered differently for festive occasions or when preparing the deceased for the afterlife.

The remains of a leather shoe with one to three layers of fabric inside were found in south west Finland in the Raisio Ihala cemetery grave IV (KM 14676:158). The textile has not been identified more accurately, but it is thought to have been a "part of a foot wrap" (Itkonen 1960, 43; Hirviluoto 1987, 14). So far, no finds have been made in Finland that would confirm what the ancient Finns wore inside their shoes but foot wraps are known from the Liv graves in Latvia (Zariņa 1988, 102; Žeiere 2005, 79).

In later centuries, rectangular foot wraps were part of folk costume in Finland. In winter, they were made of wool, and in summer of linen. In the peripheral regions and as late as the 19th century, the legs were sometimes protected with leg coverings (*kalsut* in Finnish) that reached from ankle to knee. They were either made from a single piece of fabric or sewn into a straight tube and tied with ribbons (Sirelius 1916, 220–222; Kaukonen 1985, 94). A quite similar simple leg wrapper that dates to the Roman Iron Age has been found in Denmark: the bog finds in Søgaards Mose included pieces of cloth that had been wrapped around the legs and tied below the knee and above the ankle with long cords (Hald 1980, 34–36, 335, figs. 19, 20).

Leg bindings were also part of ancient attire in Finland and the Baltic countries (Zariņa 1988, 102; Žeiere 2005, 79; 2017, 123, 127–128; Riikonen 2006, 208–209; 2019, 160–171, figs. 7–11; Rammo and Ratas 2016). Long, narrow, wool leg bindings, often of blue, were wrapped spirally around the legs and tied with braids. Remains of leg bindings woven in broken twill have been identified in at least four Late Iron Age women's graves in south west Finland (Turku Kirkkomäki grave 27, KM 27025:27203, Kirjavainen and Riikonen 2007b, 135, 137, table 1; Turku Kirkkomäki grave 31, KM 27196:31066, 31075, 31086, Riikonen 2019, 169–170; Halikko Rikala grave 47, KM 13298:141, Riikonen 2019, 166–167; the Ravattula Ristimäki grave 20/2016, TYA 993:214:29, Riikonen 2019, 168–169).

Most likely, socks made in a single needle looping technique were more common in Iron Age Finland than the one fragment of a looped sock dated to the 12th century suggests (Piikkiö Huttalanmäki, grave G2, TYA 388:57; Luoto 1989, 48–49, 51). The textile fragment lying on a piece of shinbone indicates that the looped sock reached at least halfway up the shin (Riikonen 2019, 159, figs. 1a–b).

Ravattula Ristimäki red hose

What kind of leg coverings were these red pieces of fulled fabric that were tied with narrow, colourful tablet-woven bands below the knee? They could not have been leg bindings: the remains next to the left leg clearly show that it was not a strip but a wider piece of fabric. In addition, the diagonal twill weave and the red dye do not support the leg-binding interpretation. If the fabric did not continue further down the leg towards the foot than what has been preserved, they could have been leg wrappers that covered the shin from the ankle to the knee, similar to the ones found in Denmark dating to the Roman Iron Age (Hald 1980, 34–36, 335, fig. 19, fig. 20) or the ones used in Finland as part of folk costume into the early 20th century (Sirelius 1916, 220–222; Kaukonen 1985, 94). However, these wrappers below the knee, and, to remain in place, they had to be tied around the ankle, or so that the band encompassed the length of the shin. A separate sock or cloth wrap was still needed to protect the foot.

The wool for the red fabric in Ristimäki grave 41/2016 was carefully chosen and sorted, and it was treated and woven in a characteristic Finnish 2/2 twill weave with plied warp and a single yarn weft (see Bender Jørgensen 1992, 99–100) for a specific purpose. The yarns or the fabric were dyed with a rare and expensive imported dye that required special knowledge. The finished fabric was fulled, which demanded even more work. The fabric was sewn into leg coverings that reached above the knee. Narrow patterned bands were woven and tied with elaborate tassels and bronze spirals to fasten them.

Fig. 8: Reconstruction of the Ristimäki hose and the fastening bands (Image: Jaana Riikonen)

All these features indicate that the legs of the deceased in the Ristimäki grave 41/2016 were not covered in a traditional way. Her dress is also different from a typical Late Iron Age woman's dress – a mantle dress made from one piece of fabric, with the warp crosswise in the grave (Lehtosalo-Hilander 1984, 54) – because it was sewn together from many fabric pieces and had a longitudinal warp. Altogether, they suggest that the leg coverings were also a new fashion, something that points forward to the Middle Ages: a hose sewn from red fabric with fastening bands (Riikonen 2019, 179).

Most likely, the deceased from the early 13th century grave wore sewn fabric hose that reached above the knee (fig. 8). Fulled fabric was easier to sew and could be made with narrower seams since it does not fray. Fulled wool is warm and absorbs moisture, so it would work well covering the foot inside the shoe. It is evident where the tablet-woven band is tied: the narrow part between the knee and the calf. The middle point of the band was first placed in front of the shin, then the band ends were wrapped around the leg and tied together in front with the spiral decorated tassel ends arranged horizontally on the leg (Riikonen 2019, 180).

Currently, there are no known contemporary counterparts for the Ristimäki hose. Information about medieval foot and leg coverings in Finland is very scarce. No fragments recognisable as hose have been identified so far among 14th and 15th century textiles from urban archaeological contexts (pers. comm. Kirjavainen 2019). Interpreting sources from different eras is challenging because the differences between hose and trousers was vague for a long time, and the names given to pieces of clothing varied (Owen-Crocker 2004, 255–256).

There are long leg coverings for men from 14th century London called hose. It can be deduced from manuscript illuminations that bias-cut legwear was already in use in England in the 11th or 12th centuries. The bias cutting allows for more elasticity to the garment but also uses more fabric. Men's long hose usually reached from foot to thigh and was attached to a belt with cords, whereas women's hose is thought to have reached from the foot to below the knee and was held in place with bands tied around the leg. The hose for both men and women had a seam at the back (Crowfoot et al. 1996, 185–187). A pair of long hose from the early 14th century was discovered in Sweden on a man found in Bocksten bog, and similar examples have been found in the medieval Herjolfsnes graves in Greenland (Nockert and Fredriksson 1997; Østergård 2004, 223).

The dye analyses have shown that from the dozens of yarn samples taken from women's graves in Ristimäki, the only ones identified as dyed with madder are the red fulled fabric and the red yarn in the tablet-woven band (Vanden Berghe 2019, 17). The late 14th century *vadmal* finds that were woven from local wool, dyed with madder, and found during the urban Turku archaeological excavations are proof of professional dyers working in the area at the time (Kirjavainen 2002, 349). The madder dyed textiles from Ristimäki were most likely woven from locally produced wool as the fibre analysis suggests, and the origin of the hose was defined as domestic production. The import of rare and expensive red dyestuff dates to the early 13th century in the Turku region (Kirjavainen and Riikonen 2007a, 172). The craft of dyeing with madder was later influenced by the medieval European tradition as well as the use of alum (Peets 1998b, 290; Kirjavainen 2002, 348, 350; Vajanto 2015, 51–52).

Conclusion

The findings in Finnish Late Iron Age women's graves are usually concentrated around the chest and waist area, and only in a few cases have there been textile finds around the legs, the remains of a shoe, or fabric inside a shoe. The grave found in Ravattula Ristimäki brings significant new information to what is known about early leg coverings. The deceased woman was wearing hose made of red, fulled fabric, tied below the knees with narrow patterned tablet-woven bands. But not even in this case was there any textile to be found near the feet. Among other features, the quality and the red madder colour hint at fabric hose that was common later in the Middle Ages. The Ristimäki hose are the only examples so far found in the northern Baltic Sea Region, with no currently known contemporary equivalents. In addition, the wool dress of the deceased, sewn from several differently sized fabric pieces, points towards an outfit that was at variance with the conventional Late Iron Age Finnish woman's outfit (fig. 9).

The grave dates to the early 13th century, which was a time of great societal and religious change in south west Finland. During this century, the influence of the kingdom of Sweden and the Catholic church grew, as did the connection to west European medieval culture. According to the archaeologist Markus Hiekonen, the formation of parishes began and the communities started to pay tithes during the 1220s or 1230s (Hiekkanen 2010, 343). At the same time, Finland's first episcopal see was moved to the banks of the River Aurajoki, 3 km from Ristimäki,

Fig. 9: Reconstruction of the Ravattula clothing: a small silver brooch was fastened to the likely undyed twill wool cloth, the purpose of which is still unknown. The reconstructed brooch was used to fasten the long, narrow head cloth. Red was used as an alternative (as shown in the reconstruction) to the natural grey wool fabric because the colour fits well with the red hose (Image: Anne-Mari Liira)

Fig. 10: The body in Ristimäki grave 41/2016 was probably dressed in an undergarment of plant fibre, a wool dress and a head cloth, and the red hose. The fastening bands of the hose did not show because they were under the dress hem. An apron was low on the body, apparently without ties. Before the coffin was closed, the body was also covered with a blue shawl (Image: Jaana Riikonen)

attracting more people and helping to spread new ideas and commodities. Later, around the year 1300, the city of Turku was founded closer to the mouth of the river and the cathedral was built there (Harjula et al. 2018, 319).

One novelty in 13th century Finland was western European female fashion. At first, only some features of dress were adopted by the wealthiest in society, such as the madder red dye and certain pieces of clothing. Gradually, the traditional Iron Age dress was completely abandoned and some of the old craft techniques forgotten. The transition was faster in south west Finland than in eastern Finland, where women still dressed in the style of the Viking Age outfits into the 13th and 14th centuries (Lehtosalo-Hilander 1984, 58–59).

The woman in the Ristimäki grave 41/2016, who was buried beside the church wall, was covered with a blue apron and shawl decorated with bronze spiral ornaments, and she had a spiral-decorated headband. All the blue spiral-decorated textiles and tablet-woven bands preserved in the grave represent the old Iron Age tradition and crusade period fashion of a wealthy rural woman. But her tailored dress and red hose under it reveal the influence of new western European medieval fashion (fig. 10).

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