Case #XX

NAME Educational Activities Committee

Instructions for submission

- Please include your name, place of practice, and title on the next slide. Also include information from any other contributors.
- Please make sure that the materials used are not previously published. NAME will not take ownership of these materials and they can be used for publication in the future.
- Please use either:
  - Multiple choice (A-D) (preferred)
  - Free text answer (we will occasionally accept)
- Do not use previously published images for the explanations if possible. If needed, provide references.
- Please provide a few references at the end so trainees can do further reading if they are interested.

Case provided by:

Amy Tharp-Myers, MD
District Chief Medical Examiner
Office of the Chief Medical Examiner, Western District, Roanoke,VA
Co-Chief of the NAME EAC Committee

Photo 1

Case history

This elderly woman was found unresponsive at home. Drawers were pulled out and items were thrown around the room. Police were concerned for possible burglary. At autopsy, the pattern on the neck was identified.

The pattern is most consistent with what?

A. Wrinkles in neck skin
B. Ligature mark from electrical cord
C. Ligature mark from rope
D. Livor pattern from shirt collar

Answer...

B. Ligature mark from electrical cord (Correct answer, 42.38% of responses)

Ligatures are effectively any object that can be used to apply pressure to the neck such that there is constriction of all or part of the neck circumference. Typical ligatures have flexibility allowing them to follow the curvature of the neck. Lack of flexibility may interfere with compression of the neck structures that lead to asphyxia (primarily the jugular veins and carotid arteries). As such, frequently seen ligatures consist of strings, ropes, wires, belts, chains, fabric/sheets or articles of clothing.

Ligatures can lead to pronounced abrasions of the skin with patterns related the shape, size and construction of the object being used, but can also leave little to no apparent external injury [1, 2]. Careful evaluation of the neck at autopsy for injuries is important since these findings can be subtle. If a ligature furrow is present, comparison to the reported ligature can be vital to avoid missing a “staged suicide”. It can also be important to help determine what type of ligature might be involved in cases in which the ligature has been removed or is not present on scene. In this case, the ligature had been removed from the body and plugged back into the wall by the offender, whose DNA was recovered on the cord by forensic tests. Ligature strangulations are more frequently homicidal than suicidal and furrows are more likely present in homicidal strangulations compared to suicidal ligature strangulation[4].

Electrical cords come in many sizes and various shapes, consisting of conducting wires surrounding by insulating rubber or PVC and additional outer sheath for protection[3]. Two wire cords (with two prong plug and without a grounding wire) can be shaped such that their outer sheath separates the cords with a central “groove” in the sheath. When used as a ligature, this central groove can provide a space where skin between the two wires can be pinched, producing the faint red abrasion seen in between the two pale compressed areas in the ligature furrow of this case.

In this specific case, the suspect confessed to strangling her with an extension cord as a weapon of opportunity on scene.

Example of two wire extension cord

Image generated by AI

Abrasion from skin pinched in the central groove of the extension cord

Other responses…

A. Wrinkles in neck skin (35.32% of responses)

Wrinkles in elderly persons can create folds and occasionally the skin in the folds is compressed and pale. They should follow the natural folds in the skin. In this example photo to the right, the skin wrinkles appear as pale areas in the area of contusion on the left side of the neck.

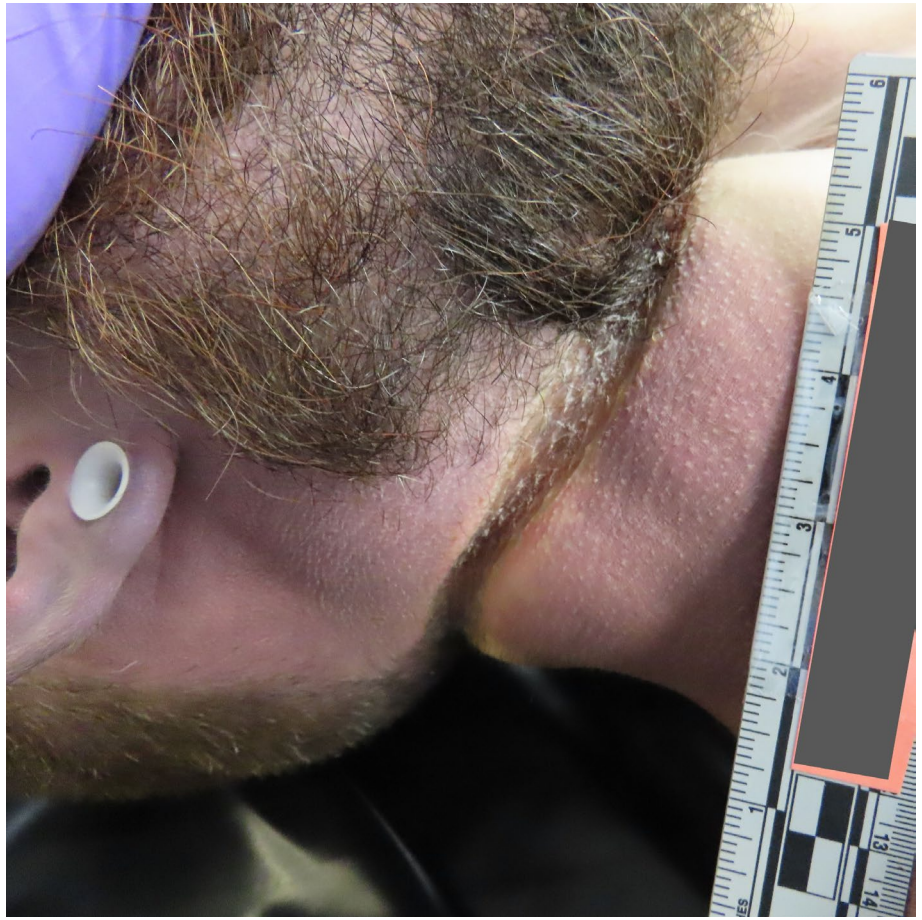
However, in this case, the pattern does not appear to follow skin folds and other wrinkles in the image do not show the pattern demonstrated by the ligature furrow.

If there is any concern that what you are seeing on the neck might be a ligature furrow of any kind, it should be treated with extra caution and thorough investigation, including neck dissection.

C. Ligature mark from rope (6.83% of responses)

- All ligatures can create a possible pattern, including ropes, belts, and any other object used as a ligature. Rope patterns can be braided, twisted or with little pattern associated, depending on the specific rope used. Having the ligature (or photographs of the ligature) available for comparison to the ligature is the best practice to verify that the pattern is consistent. On the next slide, you can see the comparison between a braided rope noose ligature to the pattern on the neck after removal of the ligature.

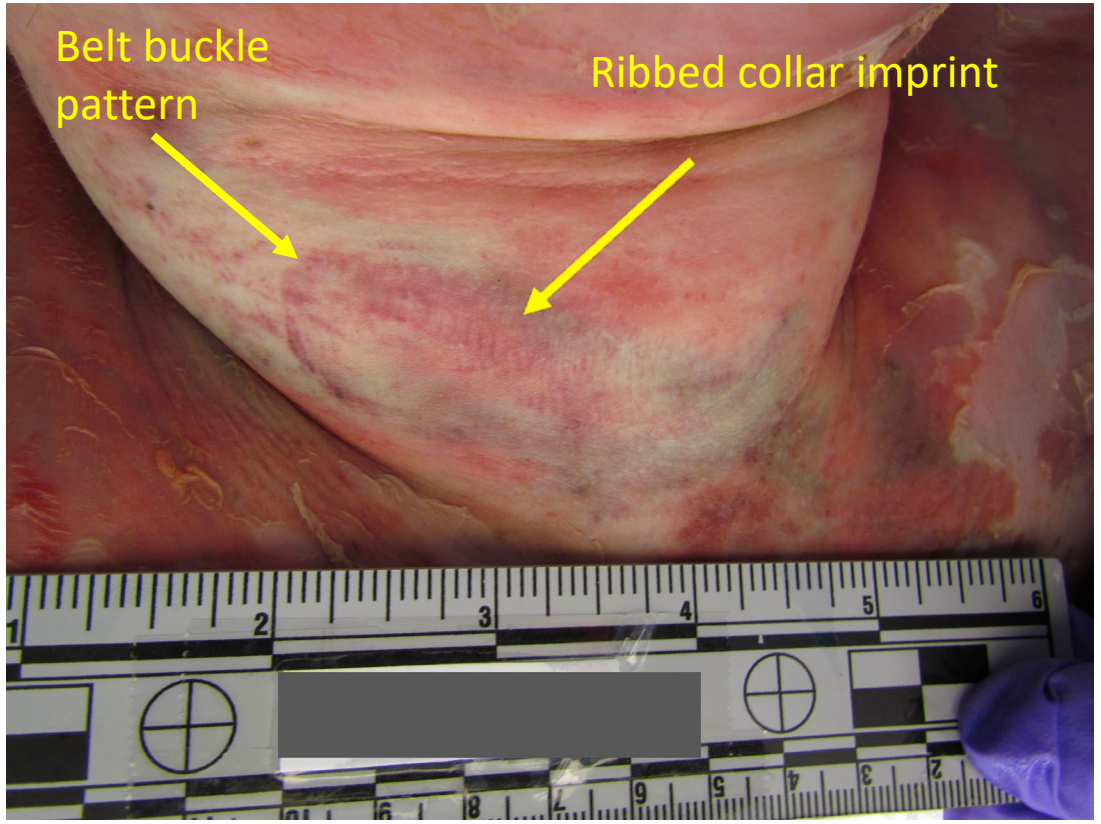
Example photos for rope ligature



D. Livor pattern from shirt collar (15.48% of responses)

Livor patterns from clothing can create impressions on the body, including shirt collars that occasionally can appear similar to a ligature furrow. However, they would be less likely to create a double impression with the central abrasion.

In this photograph, there is a collection of parallel faint abrasions that matched the decedent's ribbed collar t-shirt. This was a ligature strangulation by belt and the additional ovoid shape abrasion was from a belt buckle, with the force of the ligature compressing the shirt collar into the skin of the neck. While not explicitly a "livor pattern" in this image, the pattern would be similar in appearance.



REFERENCES

1. Saukko, Pekka, and Bernard Knight. “Fatal Pressure on the Neck.” Knight’s Forensic Pathology, Third Edition, Great Britain, Hodder Arnold, 2001, pp. 368–394.
2. Spitz, Werner, and Francisco J. Diaz. “Asphyxia.” Spitz and Fisher’s Medicolegal Investigation of Death, Fifth Edition, Springfield, Illinois, Charles C. Thomas, Ltd. , 2 Mar. 2026, pp. 405–466.
3. Dylan, Kier. “A Comprehensive Guide to Understanding Power Cords | Student Healthy Life | Miami University.” Miamioh.edu, 8 May 2025, sites.miamioh.edu/student-healthy-life/blog/a-comprehensive-guide-to-understanding-power-cords/.
4. Maxeiner, H, and Britta Bockholdt. “Homicidal and Suicidal Ligature Strangulation—a Comparison of the Post-Mortem Findings.” Forensic Science International, vol. 137, no. 1, 14 Oct. 2003, pp. 60–66. doi.org/10.1016/S0379-0738(03)00279-2.