

CASE REPORT

Axel Schnabel · Peter Neis · Hansjürgen Bratzke

Cycles of the uterus mucous membranes and estimation of time of death

Received: 28 June 1996 / Received in revised form: 12 November 1996

Abstract In a case where a 27-year-old prostitute was found stabbed to death, histological examination of the uterus mucous membranes was performed to estimate the time of death after a long postmortem interval. The time of menstruation was obtained from a witness statement. Assuming a regular cyclus, the histology of the uterus tissue indicated an early stage of menstruation suggesting that death occurred shortly after the woman disappeared.

Key words Time of death · Uterus mucous membranes · Postmortem interval

Introduction

In cases of long postmortem intervals the estimation of the approximate time of death is difficult. Certain circumstances such as the population of flies and maggots infesting the corpse or the plant growth around the site may provide important information [1–3]. The postmortem cell content of cerebrospinal fluid can also serve for estimating the time of death [4]. Other authors reported the forensic value of the immunohistochemical detection of oestrogen receptors in vaginal epithelium [5].

In the following case the time of death was estimated by histological examination of the uterus tissue in combination with a testimony relating to the antecedents.

Case history

In the late afternoon of October 31st 1995, a 27-year-old prostitute was found stabbed to death in an asparagus field. The body was lying in a left lateral posture. The upper part of the body was clothed, the lower part was not. The ambient temperature was 19°C, the ground temperature 12°C and the rectal temperature of the corpse

15°C. The weather was windy, partly cloudy and there had been rain showers over the previous days. The skin of the fingers was partially waterlogged. After moving the body into a dorsal position, putrefaction was obvious (smell). A large pool of partially liquid and partially dried blood was present beneath the corpse and rigor mortis had receded as proved by joint flexing. The autopsy revealed 32 stab wounds in the neck, the thorax and the upper part of the abdomen. The heart was pierced by four fatal stab incisions. The upper vagina contained a sponge the size of an orange and the uterus was filled with blood. In the right ovary a marginal corpus luteum in retrogressive state was recorded. Toxicological analysis of blood and urine revealed diazepam in therapeutic concentrations (0.13 mg/L in blood) but no blood alcohol was present.

According to the police report the woman had been seen alive 7 days before the discovery of the corpse. Three days before she disappeared she talked to a friend and mentioned that her menstruation had started. Other data for estimating the postmortem interval and the time of death were not available. This raised the question whether a histological examination of the uterus tissue, particularly the mucous membranes, could provide further evidence as to whether the woman was killed on the day she disappeared or a few days before the corpse was found.

Histological examination

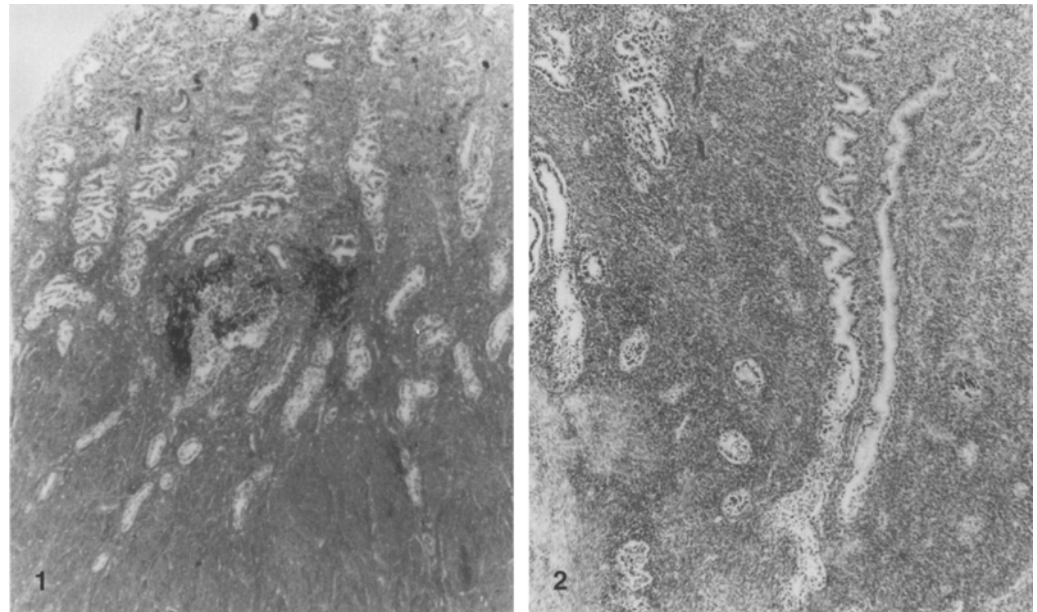
The inner layer of the uterus mucous membranes was already beginning to detach. Small haemorrhagic areas between the glandular bodies were observed (Fig. 1) and leukocytes had accumulated in the stroma. The glandular ducts exhibited a sinuous formation (Fig. 2) and so-called spiral arteries were present. These histological findings indicated an early stage of menstruation.

Discussion

The present case demonstrates that the various stages of increase and reduction of the uterus mucous membranes may provide important information for estimating postmortem intervals or time of death. On average menstruation starts after a 28-day interval (± 3 days) and continues for about 4 days. The gradual transition from the stage of proliferation to the secretory stage occurs in the middle of the cycle, when ovulation begins. The stage of menstruation corresponds to the first 4 days of proliferation. Therefore, the histological status of the uterus mucous membranes can be correlated with these stages. In gynaecolog-

Fig. 1 Uterus mucous membranes, myometrium and endometrium, of the 27-year-old woman. The upper layer of the endometrium is already detached, haemorrhagic foci are present in the lower mucosa (Haematoxylin-eosin, $\times 192$)

Fig. 2 Sinuous form of the gland ducts of the endometrium (Haematoxylin-eosin, $\times 240$)



ical histopathology it is common to diagnose the stage of endometrial development. In most cases the examiner is able to decide what day of the menstrual cycle the endometrial changes represent [6, 7]. In our case the examined tissue of endometrium revealed no significant autolytic changes which had, therefore, no influence on our examination results. However, this applies only to women still able to deliver. Therefore, these studies are of no value in women before the menarche or in the menopause. Oral contraceptive drugs, particularly those of the estrogen-gestagen type, usually cause a regular cycle, but with a shorter menstruation period. This is due to an inhibition of the glandular proliferation on the endometrium by the gestagens leading to a secretion histologically characterized by a pseudodecidual endometrium and by few glandular ducts only.

In the present case the woman had not taken oral contraceptive drugs but other measures of contraception (witness statement). Therefore, regular cycle stages could be assumed and October 22nd was assumed to be the onset of her menstruation. Considering the fact that the victim disappeared on October 24th, the time of death was estimated to be between 24th and 26th October. Since the histological evaluation of the menstruation cycle suggested a rather early stage, the woman could have died at the time

when she disappeared (October 24th). Under these circumstances a shorter postmortem interval was excluded. In similar cases, particularly in those of long postmortem intervals, this method of estimating the time of death should be considered. The uterus mucous membranes and ovaries should be histologically examined and information about the menses be collected.

References

1. Catts EP, Golf ML (1992) Forensic entomology in criminal investigations. *Ann Rev Entomol* 37:257–272
2. Reiter C, Hajek P (1984) Zum altersabhängigen Wandel der Darmtraktfüllung bei Schmeißfliegenmaden – eine Untersuchungsmethode im Rahmen der forensischen Todeszeitbestimmung. *Z Rechtsmed* 92:39–45
3. Knight B (1996) Forensic pathology. Edward Arnold, London
4. Wyler D, Marty W, Bär W (1994) Correlation between the post-mortem cell content of cerebrospinal fluid and time of death. *Int J Legal Med* 106:194–199
5. Hausmann R, Baltzer M, Schellmann B (1996) The forensic value of the immunohistochemical detection of oestrogen receptors in vaginal epithelium. *Int J Legal Med* 109:10–13
6. Sternberg S (1992) Histology for pathologists. Raven Press, New York
7. Dallenbach-Hellweg G (1987) Histopathology of the endometrium. Springer, Berlin Heidelberg New York