

A case report on the prolonged viability of postmortem human testicular sperm

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Objective: To report a case of postmortem sperm retrieval with prolonged viability and motility.

Design: Case report

Setting: Hospital and Medical Examiner Department

Patient(s): A 44-year-old African American male patient with a history of recreational marijuana use and occasional alcohol consumption who died from a cardiac arrest because of drug overdose.

Intervention(s): Multiple testicular biopsies and sperm analyses.

Main Outcome Measure(s): Sperm viability and motility of testicular biopsies at serial time intervals.

Result(s): Sperm obtained from the testis in the morgue remained viable and motile even at 106 hours (>4 days) postmortem.

Conclusion(s): Our study found that sperm obtained from the testis remained viable and motile even after being thawed after cryopreservation, even when obtained up to 100 hours postmortem. This may have implications on the timeframe that postmortem sperm retrieval can be performed successfully several days after death. (Fertil Steril Rep® 2023;4:235–8. ©2023 by American Society for Reproductive Medicine.)

Key Words: Case report, postmortem sperm retrieval, sperm analysis, biopsy, assisted reproductive technology

INTRODUCTION

Postmortem sperm retrieval (PMSR) is used to collect viable sperm from a recently deceased man for future use in assisted reproductive technology (1). It has been successfully demonstrated to produce viable offspring and is often used in situations of an unexpected death or when a patient has expressed a desire to have children after death (2). The procedure was first described in 1980 by Rothman (3) and remains relatively rare, although requests for PMSR are increasing in frequency (4, 5). Whereas some countries, such as Israel and the United States,

approve of PMSR, many question the ethical dilemmas surrounding this procedure (6, 7). Not only does it pose a challenge to the establishment of universally accepted guidelines, but it is also controversial in the military, where a US Army judge has argued that PMSR should be limited to those who cryopreserve their sperm before death (8, 9). However, because most soldiers do not cryopreserve their sperm before their deployment, this may be controversial when widows of these soldiers request PMSR (8). According to the Ethics Committee of the American Society for Reproductive Medicine,

postmortem reproductive procedures may be considered ethically justifiable under certain circumstances, including written consent from the deceased or a request by the surviving spouse or partner (10). Regardless of its controversial nature, the procedure is limited by several factors that affect the viability of postmortem sperm, such as the time between death and collection, comorbidities of the patient, and storage conditions of the sperm (11, 12).

Analyzing the viability and cryopreservation of posthumous sperm provide an opportunity to offer patients and their families greater insight to help inform decisions on whether to pursue this option in specific cases. However, medical literature reports extracting viable sperm within 24–36 hours after death, which may be a challenge in certain circumstances (13). We report a unique case of a deceased 44-year-old man from a drug overdose in whom we observed sperm viability and motility on testis biopsy analysis even at 106 hours postmortem.

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CASE REPORT

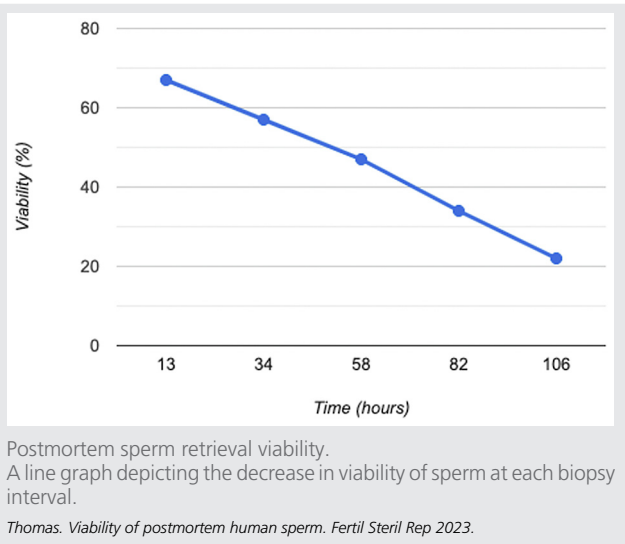
Our patient was a 44-year-old African American male with a history of recreational marijuana use, and occasional alcohol consumption was brought to the Jackson Health System in Miami with cardiac arrest. He had reported symptoms of lightheadedness, nausea, and vomiting approximately 30 minutes before arriving at the emergency department. The patient had no significant past medical or surgical history, no relevant family history, and was sexually active with one female partner, using condoms inconsistently.

On arrival, the patient was in asystole and received treatment with an automated external defibrillator, intubation, and administration of amiodarone, sodium bicarbonate, and epinephrine. A single shock was administered for a pulse check with ventricular fibrillation; however, the patient was pronounced dead at 10:43 PM, approximately 35 minutes after the onset of cardiac arrest.

The patient was identified by our study team through a search of patient lists from the Miami-Dade County Medical Examiner Department (ME) for male patients aged 15–60 years who had experienced sudden death, were not hospitalized, and had no comorbidities. A preapproved institutional review board protocol through the University of Miami Health System and Jackson Health System was used to establish this study. Our research group was only provided with deidentified subject information from the ME office. If a case met the parameters for this study, the responsibility fell on our research group to obtain next-of-kin information from the ME and be the primary point of contact for explaining the premise of the study and consenting to the next-of-kin. The next-of-kin consent was approved by a University of Miami Health System ethics team, as well as the acting director of the ME office. The ethical guidelines we followed for next-of-kin consenting included competent supervision with appropriate professional decorum. If needed, interpreters were obtained for the purposes of informed consent. We informed the next-of-kin that the study would not impact the time needed for the ME to examine the body and transfer it to the desired funeral home as well as confirmed that damage would be kept to a minimum, only involving the scrotum. All questions of the next-of-kin were answered, and consent was not coerced in any way. The next-of-kin was given every opportunity to rescind consent during the study.

The patient’s next-of-kin provided informed consent for PMSR and the submission of a case report for publication. The patient’s testicle was removed and biopsied at 13 hours postmortem, and 4 samples were collected and placed into vials containing sperm wash. The testicle was stored in an airtight, sealed container in a refrigerator at 7.2 °C in the morgue after the initial biopsy because the body had to be returned to the family after the postmortem was completed by the medical examiner. The biopsy site remained open between biopsies, but the exposed tissue was discarded, and unexposed tissue was used for subsequent biopsies. Testis biopsy analysis was conducted every 24 hours after the first biopsy to determine the viability of the spermatozoa, and biopsies and analyses were continued until the spermatozoa were no longer viable. Viability was assessed using the eosin alone method

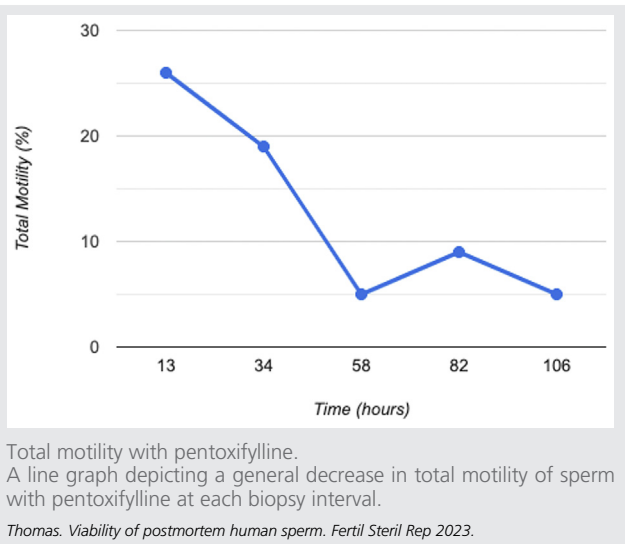
FIGURE 1



according to the 5th edition of the World Health Organization laboratory manual for the examination and processing of human semen (14). We used a centralized review of biopsy samples with a trained andrology technician (J.B.), who conducted the testicular sperm analysis for all samples.

Postmortem sperm retrieval was performed on the patient’s testicles by biopsy at 13, 34-, 58-, 82-, and 106-hours postmortem. Sperm viability was found to be 67%, 57%, 47%, 34%, and 22%, respectively, at these intervals (Fig. 1), whereas motility with pentoxifylline was reported at 26%, 19%, 7%, 11%, and 5% at the respective intervals (Fig. 2). The last surgically extracted samples contained minced epididymis and vas deferens, and the collected testicular fluid was cryopreserved using the fast-freezing technique with the

FIGURE 2



aid of a cryoprotectant media. Post-thaw analysis was performed 24 hours after the cryopreservation of the last testicular postmortem sample, and the sperm viability and motility with pentoxifylline were 5% and 1%, respectively.

DISCUSSION

Although PMSR is a relatively simple procedure, it raises numerous ethical and moral issues (6). Faced with situations in which widows of deceased soldiers request PMSR and others involving the sudden death of a spouse, we sought to identify whether 36 hours postmortem, the recommended maximum time within which viable sperm should be retrieved, is truly accurate (13). Our case presents a unique example of successful sperm retrieval because it demonstrates the longest period in which viable and motile postmortem sperm has been retrieved.

Currently, it is well-established that sperm quality diminishes with time, as evidenced by the decrease in sperm viability and motility observed in our patient at subsequent biopsies and sperm analysis (12). Therefore, it is advisable to perform PMSR as soon as possible after death to maximize the chances of successful sperm retrieval. According to current literature, PMSR should be performed within 36 hours of death (13). However, our case demonstrates that viable sperm can still be retrieved up to 106 hours postmortem, contradicting this recommendation. Given the small sample sizes in the limited number of reported cases on this topic, it is important to note that these clinical recommendations are subject to change with additional research as new findings become available (15).

A previous study determined that there is no association between the cause of death and the likelihood of successful sperm retrieval, and PMSR may be recommended for patients if the fatal event did not damage the reproductive organs (13). However, even if the reproductive organs remain undamaged, the patient's fertility and chances of successful PMSR may already be compromised because of pre-existing comorbidities, such as hypertension, diabetes, sexually transmitted infections, tumors, and various other diseases (16, 17). In contrast, our case may have been ideal for PMSR because the patient had no significant past medical, surgical, or family history, which may explain the ability to retrieve viable sperm over 100 hours postmortem.

There are several techniques for sperm retrieval in a post-mortem patient, including manual stimulation, electroejaculation, epididymal or testicular sperm aspiration, testicular biopsies, and orchiectomy with epididymectomy (13, 18, 19). In our case, the latter technique was used. Needle biopsy is generally discouraged in PMSR because of the limited amount of sperm obtained through aspiration (20). However, because of the high heterogeneity and lack of comparative studies evaluating the different techniques, it is difficult to determine whether the technique used in this case influenced the success of collecting viable sperm after an extended period of time (18).

The findings presented in this study are based on a single patient and therefore have limited generalizability. Additionally, biopsy samples were obtained from a testicle that was extracted 13 hours after the patient's death and stored in a

refrigerator. It is possible that spermatogenesis in this scenario may differ significantly from spermatogenesis in a testicle within the scrotum of a deceased individual. Thus, additional investigations are necessary to compare and analyze the differences between the 2 situations. Further research is necessary to collect data from a larger sample size to determine the reproducibility of our results. It is possible that there are confounders in the medical history of our patient that we were unable to account for because of the sudden nature of the patient's death and the limited availability of medical records identifying the etiology of the patient's cardiac arrest. Although our data are derived from the sperm collected from a single patient, the observation of viable and motile sperm over 100 hours postmortem highlights the need for additional studies to explore the potential for extending the current recommended time frame of 36 hours for PMSR.

This patient, who had no significant comorbidities before death, presented with viable sperm at 106 hours postmortem, a significantly longer time frame than what is reported in the literature. The viability of posthumous sperm for reproductive purposes is a topic that may be raised during medical consultations, and the findings of this study have the potential to inform the guidance provided to patients and their spouses on this matter. Although further research is needed to determine the optimal timing and techniques for PMSR to maximize the chances of success in assisted reproduction, the data suggest that the window for successfully retrieving viable and motile sperm may be wider than previously documented in the medical literature.

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