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Remarkable spermatozoa survival after lethal high energy trauma raises the innovative concept of "reproductive resuscitation"

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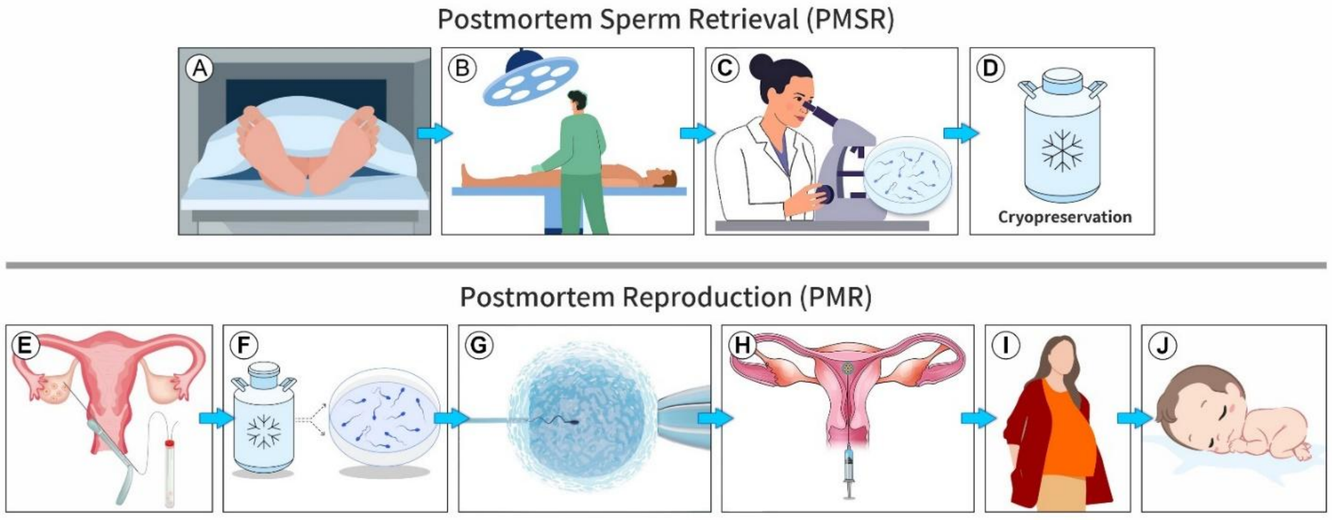
INTRODUCTION

Postmortem sperm retrieval (PMSR) is the extraction of viable sperm from a recently deceased male to be used for fertilization at a later time. Since the first report in human in 1980, many cases were performed sporadically characterized by heterozygous surgical methodologies. Since Hammas attack on Israel and later during the war, combination of extremely high number of deaths of young men, regulatory changes and increased public awareness to PMSR, resulted with highest than ever PMSR performance rates. The aim of the current study was to report PMSR outcome after lethal trauma.

METHODS

This retrospective study included all PMSR cases performed between Oct 7th, 2023, until July 31st, 2024, in Andrology unit in a tertiary referral center. First 6 cases (group 1) were conducted after the attack of Hammas on Oct 7th, 2023, while 28 cases (group 2) were performed among IDF soldiers killed in combats in Gazza strip. All death mechanisms involved high energy and immediate death. Testicular sperm extraction (TESE) *in-vivo* followed by immediate laboratory testicular samples exploration and spermatozoa cryopreservation. The primary outcome was spermatozoa retrieval mainly related as motile spermatozoa for cryopreservation. All cryopreserved vials may be possible used in the future for postmortem reproduction (PMR, figure 1)

Figure 1: The concept of reproductive resuscitation - PMSR with optional future PMR



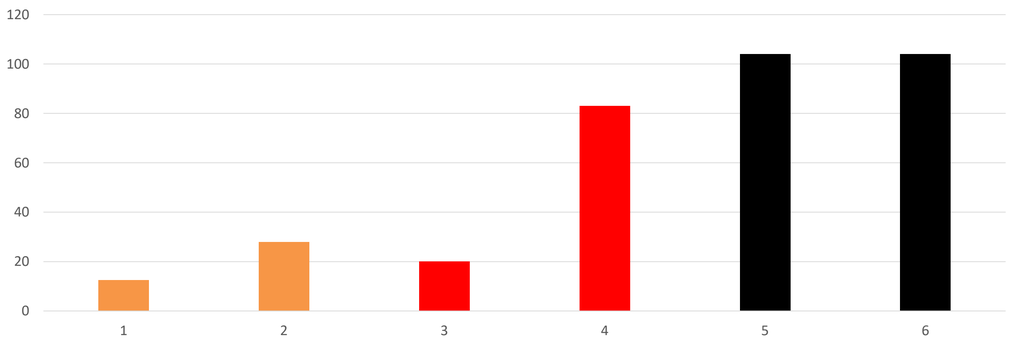
PMSR - Upon completion of legislation process and consents signature, body is transferred for PMSR performance (A). TESE *in vivo* (B) is followed by laboratory exploration of the testicular tissue samples (C). The retrieved spermatozoa are cryopreserved in liquid nitrogen (D).

PMR – The intended mother undergoes IVF including oocyte pick up (E). Cryopreserved spermatozoa are thawed (F) and single cells are injected directly to the eggs by intracytoplasmic sperm injection (ICSI) procedure (G). Fertilized eggs are incubated to achieve viable developed embryos which can be transferred to patient's uterus (H), hopefully resulting with viable pregnancy (I) and healthy live birth (J).

RESULTS

Overall**,** sperm was found in 32 (94.1%) and motile sperm in 27 (79.4%) men. In group 1, characterized by progressive harvest time elongation, sperm was found in 4 men - 2 of them included motile sperm (figure 2). Group 2 was characterized by stable harvest time with an average of 11.9±3.5 hours. Sperm was found in all deceased with motile spermatozoa preservation in 25 (89%) men (table 1).

Figure 2: PMSR outcome in group 1 according to harvest time (hours)*



*Green bars represent motile spermatozoa; Red – non-motile spermatozoa; Black – no spermatozoa found

Table 1: PMSR performance in group 2

Cases #	Age	Time of death	Time of PMSR	Harvest time	Motile sperm
1	22	14:00	1:30	11.5	Yes
2	27	12:00	22:30	10.5	No
3	21	12:00	0:30	12.5	Yes
4	28	14:00	1:30	11.5	No
5	21	11:00	18:30	7.5	Yes
6	24	12:00	2:30	14.5	Yes
7	25	11:30	22:30	11	Yes
8	25	11:30	23:00	11.5	Yes
9	23	17:00	4:30	11.5	Yes
10	35	17:00	5:00	12	Yes
11	20	17:00	5:30	12.5	Yes
12	19	17:00	6:00	13	Yes
13[2]	26	17:00	6:30	13.5	No
14[2]	19	17:00	8:00	15	Yes
15	21	15:30	0:30	9	Yes
16	19	1530	22:30	7	Yes
17	26	1330	4:30	15	Yes
18	21	2:00	1300	11	Yes
19	33	1600	8:30	16.5	Yes
20	29	1600	9:00	17	Yes
21	38	1600	1200	20	Yes
22	24	1500	2100	6	Yes
23	20	2000	400	8	Yes
24[3]	20	1430	2300	9	Yes
25[4]	20	1900	230	7.5	Yes
26	20	2100	1530	18.5	Yes
27	24	14:30	1:30	11	Yes
28	38	12:00	22:00	10	Yes
Average	**24.6**			**11.9**	
SD	**5.6**			**3.5**	

CONCLUSIONS

Harvest time is the dominant factor in successful sperm retrieval in PMSR rather than trauma mechanism and severity. Distinctive spermatozoa survival in lethal trauma raises the narrative concept of "reproductive resuscitation", which enables postmortem continuity and fatherhood. If conducted appropriately, reproductive resuscitation has global potential to adjust social and medical conception of death.