

MORPHOLOGICAL DEFECTS OF SPERM IN PATIENTS WITH NORMAL SPERM COUNT

*Dr. Angela Phukan and Dr. Amit Sinha

Department of Pathology, Silchar Medical College & Hospital, Silchar, Cachar, Assam

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ABSTRACT

Sperm morphology is an important factor in analyzing male infertility. The assessment of the percentage of spermatozoa having an ideal morphology is done according to the WHO laboratory manual for semen analysis. **Aim:** To study the morphological defects of sperm with normal sperm counts. **Materials and Methods:** It is a prospective study. 86 cases with normal sperm count were included in the study. Morphology was analysed on Papanicolaou stained smears. The defects were categorized into: Head defects, neck defect, mid piece defect and tail defects. **Results:** Sperm morphology defects were found in all cases with normal sperm count. Defects in the head was the commonest followed by mid piece defect and tail defects. The abnormalities ranged from 1-20%. Tapering head (86%) was the most common abnormality in the head, in the mid piece defect, thick mid piece (60.4%) was the commonest and coiled tail (23.2%) was the most common tail abnormality. 82 cases had multiple abnormalities. Combined head and mid piece abnormalities were the most frequently encountered followed by combined head, neck and mid piece defect. **Conclusion:** Morphological defects of sperm are found even in cases with normal sperm count.

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INTRODUCTION

Global estimates suggest that nearly 72.4 million couples experience fertility problems (Boivin, 2007). It varies across regions of the world and is estimated to affect 8–12% of couples worldwide (Sciarrà, 1994 and Population Council, 2004). It was reported that 40% of infertility cases were related to men, 40% of women and 20% of both sexes.⁴ In Indian couples seeking treatment, the male factor is the cause in approximately 23% (Zargar, 1997). Semen analysis is an important investigation for the detection of infertility in men.⁶ Semen analysis done using the WHO criteria includes quantitative and qualitative examination (World Health Organization, 2017). It provides insight not only on sperm production (count), but the sperm quality (motility, morphology) as well (Fisch, 2008). Although sperm count is in normal limits, the same may not be true for the semen quality. Sperm morphology and sperm motility is a major component of sperm analysis and has been considered as a good indicator of semen quality (Rodriguez-Martinez, 2003).

Sperm is assessed for head, middle piece and tail defects. Not much study is done on the morphological defects of sperm in patients with normal sperm count. Hence this study was done with an aim of finding morphological defects of sperm in patients with normal sperm counts, which were referred from the infertility clinic.

MATERIALS AND METHODS

Study design: Prospective hospital-based study conducted in the Department of Pathology, Silchar Medical College and Hospital from January 2017 to December 2017.

Data collection and analysis

Inclusion criteria: All cases with normal sperm count (>15million/ml) were included in the study.

Exclusion criteria: The cases with decreased sperm count were excluded from the study. Sample collection was done as recommended by WHO (2010). Samples were collected in a clean-capped plastic container.

*Corresponding author: Dr. Angela Phukan

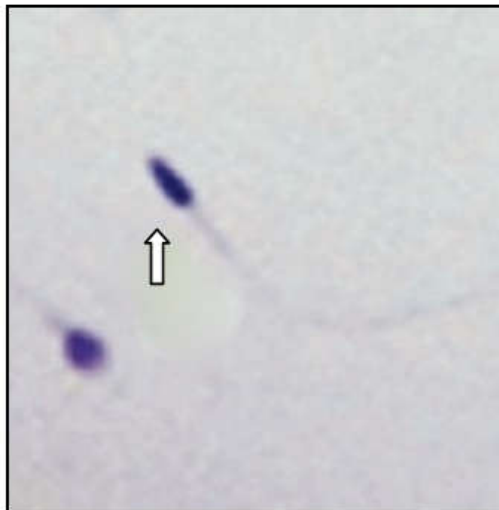
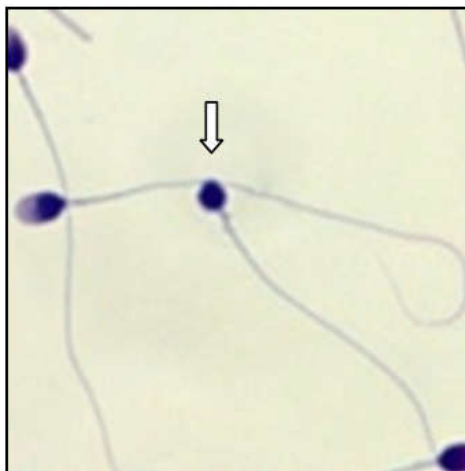
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Silchar, Cachar, Assam

Table 1. Morphological abnormalities of the sperm

Part of Sperm	Abnormalities	Number of cases with abnormalities	Percentage of sperms showing abnormalities	
			<5%	5-20%
Head	Tapering	74	41	33
	Round	45	42	3
	Large	16	16	0
	Others	5	5	0
Midpiece	Bent Neck	32	31	1
	Thick	52	32	20
	Residual Cytoplasm	9	9	0
Tail	Coiled	20	18	2
	Bent	18	17	1
	Double	4	4	0

Table 2. Number of cases with multiple abnormalities (82/86)

Part of Sperm with abnormalities	No. of cases
Head	12
Head and Neck	6
Head and Midpiece	21
Head and Tail	5
Head, Neck and Midpiece	19
Head, Neck and Tail	4
Head, Midpiece and Tail	8
Head, Neck, Midpiece and Tail	7

**Fig. 1. Tapering head****Fig. 2. Small head**

After collection and with proper liquefaction, samples were assessed for volume, viscosity, color, appearance, sperm count, motility, presence and absence of red blood cells/white blood cells, agglutination, and sperm morphology. All other parameters were assessed on fresh sample; however, for sperm morphology, smears were fixed in ethanol and then assessed after Papanicolaou staining. Morphology was classified as defects in the head, middle piece, and tail. The abnormalities were noted for their presence or absence. These were tapering head, large head, small head, round head, and bifid head for head; bent neck, broad middle piece, and excess residual cytoplasm for middle piece; and coiled tail for tail. The frequencies of all these morphological abnormalities were studied.

RESULTS

Out of total 108 samples sent for examination during the period, 86 cases had normal sperm count which were included in the study and examined for the presence of various morphological abnormalities. Sperm count was >15million/ml in these cases. The different morphological defects present in the samples are given in the Table1. The most common morphological abnormalities were found in the head followed by mid piece defect and tail defects. The abnormalities ranged from 1-20% and maximum number of cases had <5% abnormality. No case showed >20% abnormality. Tapering head was the most common abnormality in the head, in the mid piece defect, thick mid piece was the commonest and coiled tail was the most common tail abnormality. 82 cases had multiple abnormalities. Combined head and mid piece abnormalities were the most frequently encountered followed by combined head, neck and mid piece defect. 7 cases had abnormalities involving head, neck, mid piece and tail combined. 12 cases had multiple abnormalities of the head. The details are given in Table 2.

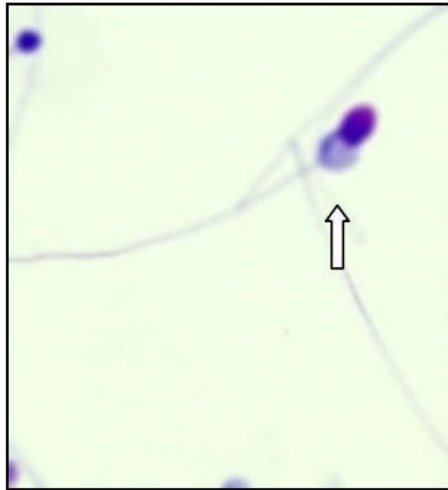


Fig. 3. Excess residual cytoplasm

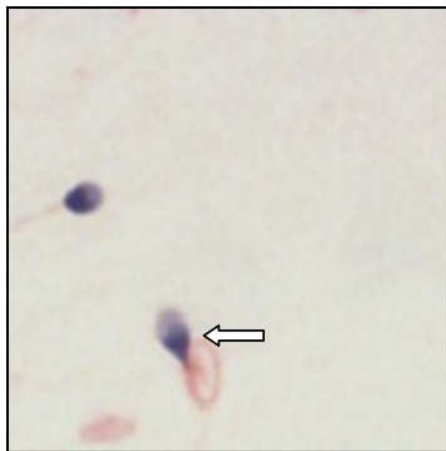


Fig. 4. Coiled tail

DISCUSSION

Semen analysis includes both sperm count as well as sperm morphology (WHO, 2010). Both sperm count as well as sperm morphology is an important parameter in evaluation of infertility. Different types of morphological defects are found in different parts of sperm. Studies show that these defects have a prognostic bearing as some defects are irreversible, and some are reversible. Reversible defects are due to acquired/environmental factors (Singh, 2011 and Menkveld, 2010). Majority of the studies related to semen analysis is the association of low sperm count with abnormal sperm morphology whereas it is not always so. Even sperm abnormalities are associated with normal sperm count. WHO has decreased the low cut off value of sperm morphology to 4% morphologically normal spermatozoa (WHO, 2010). Karabulut A et al has found sperm morphological abnormalities even in patients with normal sperm count (Karabulut, 2013), which is in concordance with our study.

In the present study, among the different morphological defects of the spermatozoa, head defects were the commonest which is similar to other studies (Karabulut, 2013 and Nikolettos, 1999). The different head defects were tapering head, round head, megalohad of which tapering head was the commonest. Many studies have revealed the tapering head and megalohads are reversible defects which occur due to some stress or medication. Teratozoospermia is one of the important causes of infertility and miscarriage (Taşdemir, 1997).

In the present study thick mid piece defect was the most common mid piece defect. Midpiece and defects involving the neck are associated with poor prognosis (Menkveld, 2011). Presence of excess residual cytoplasm is another abnormality involving the mid piece and is associated with production of reactive oxygen species, associated with stress (Menkveld, 2010). Coiled tail was the commonest abnormality of the tail in our study. Tail plays an important part in propulsion of the sperm, thus coiled tail results in defective propulsion which may result in infertility (Auger, 2010). It has been observed that most of the specimens had more than one morphological defect. The most common combination was found to be Head and mid piece defect. Various studies have shown the association of spontaneous abortion with multiple defects. They found that sperms with multiple abnormalities cause defective embryo development and lead to spontaneous abortion.¹⁶ In the present study, we also found many cases with multiple abnormalities but no follow up related to fertility were done. Hence, further long term studies with follow up are required to support the findings.

Conclusions

Morphological sperm defects are found in patients with normal sperm count and analysis of sperm morphology even with normal sperm count should be done cautiously.

Conflict of interest: None

Ethical approval: Not Required

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