INTRAUTERINE INSEMINATION

Edited by
Gautam Nandkishore Allahbadia

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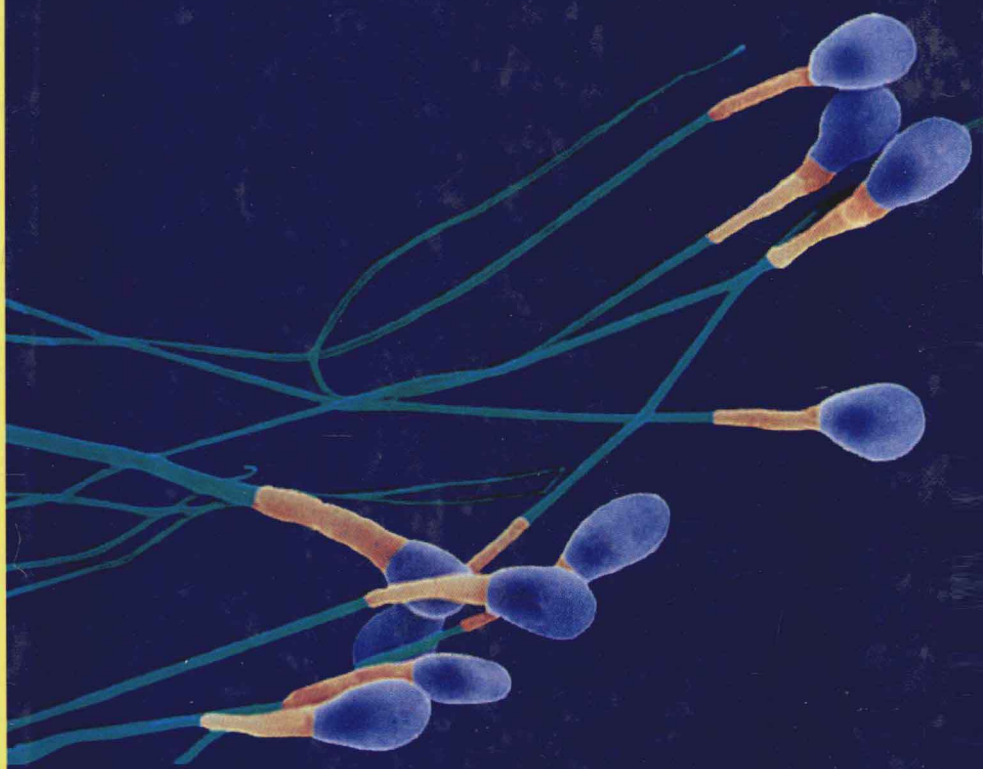
Daniel Seidman, MD



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This is for my Ganapatyji

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Foreword

This newly revised edition of Dr Gautam N Allahbadia's famous monogram on IUI is a splendid theoretical and practical guide on this important topic.

Intrauterine insemination (IUI) has a major role in current fertility care as there is good evidence in the literature that IUI is the best first line treatment and most cost-effective procedure for moderate male factor subfertility. Furthermore, in couples with unexplained subfertility, IUI combined with ovulation induction with clomiphene (CC) or gonadotrophins (FSH) is often chosen before resorting to IVF. The appropriateness of starting with these low and intermediate intensity treatments is supported by evidence that CC/IUI increases cycle fecundity two- to three-fold, and FSH/IUI, three- to five-fold over the baseline chance of pregnancy in this patient group. For these as well as physical and spiritual reasons, IUI combined with ovulation induction is often a natural starting point for couples, especially when female age and duration of subfertility are favourable.

The key to the success with IUI is the use of the most appropriate semen preparation techniques. These techniques used in IUI were developed to separate the motile morphological normal spermatozoa. Proper utilization of IUI also allows effective elimination of leucocytes, bacteria and dead spermatozoa that produce oxygen radicals that negatively influence the ability to fertilize the egg. In addition, the higher pregnancy rates achieved by IUI are also attributed to the fact that sperm is deposited directly in the uterine cavity.

This remarkably concise and clear book deals with many issues relating to IUI including proper semen analysis and morphology, semen preparation and semen cryopreservation. The book also serves an eloquent discussion of many of the topics that are still subject to intense research, including the optimal sperm preparation method, the effectiveness of a gradient and/or a swim-up and/or wash and centrifugation technique on clinical outcome, whether supplementation of culture media with substances such as antioxidants and platelet activating factor may improve the results and the value of double insemination.

This important and useful book not only provides an abundance of up-to-date practical and theoretical information, but also serves as a comprehensive guide—a real MUST—for anyone interested in setting-up and running a successful intrauterine insemination programme.

Dr Gautam N Allahbadia, an experienced busy practitioner and a world famous investigator in the field of reproductive medicine, has once again accomplished a noteworthy service by compiling a huge body of knowledge by leading experts on IUI, succinctly presented to the curious reader. This delightful book provides many essential tips critical for the success all involved in the safe delivery of modern high quality IUI services, and surely deserves a firm place on their book shelves.

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Preface

While some practitioners have the opportunity of going through formal training in IUI, many more must rely on information gathered from diverse and informal sources. Such information might not be comprehensive or easy to assimilate. The aim of this monogram is to present relevant information in an easy to read manner from diverse sources. A monogram such as this is long overdue. It provides the basic knowledge required to set-up and run an efficient IUI clinic. Intrauterine insemination (IUI) is less invasive and cheaper than many other assisted conception treatments such as *in vitro* fertilization (IVF). Various cadres of medical practitioners offer the treatment in a variety of settings. The decision to write this book was based on the fact that there was no comprehensive source of information on the conduct of IUI. Rather practitioners had to obtain disjointed information from several sources leading to a great variability in the practice and results of the treatment. I assembled a team of highly qualified professionals and we succeeded in bringing together most of what is presently known about IUI.

The book is practice oriented. Although we have in each chapter discussed the theoretical basis of the subject and the various schools of thought we have still provided practical guidelines such that the reader should become very confident and competent in providing this treatment.

Although the book is primarily directed at health professionals, non-medical persons have found the book easy to read and patients find the information provided in the book to be very useful. Furthermore, issues raised in some chapters concern not only IUI but many other assisted conception treatments. Such common topics include ovarian stimulation, ultrasound scanning, power Doppler, laboratory aspects of treatment and complications and regulation of Assisted Reproductive Techniques. I have noted copies of the first edition in a number of libraries I have visited since its publication; it is also a good reference book.

I must thank my team including Dr (Mrs) Kaushal Kadam, Mrs Goral Gandhi and Mrs Sneha Gosrani for helping me wrap up the revised second edition in a short time.

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"Excellence can be attained if you Care more than others think is wise, Risk more than others think is safe, Dream more than others think is practical, and Expect more than others think is possible."

—Author Unknown

My career so far has been driven by these words and very recently, I read the works of Robin Sharma who has deeply influenced my way of thinking and I am living life more completely today. I would strongly recommend his handbook "Who Will Cry When You Die?" to each of you leading a hectic fast-paced life—I'm sure this book will bless your life!

Contents

1

Artificial Insemination—Historical Review

Adi E Dastur

"Be fruitful, and multiply, and replenish the earth." (Genesis 1:28).

Guided by a literal interpretation of this Biblical injunction and placing a high premium on his reproductive prowess, man has even rewarded infertility as the curse supreme, exemplified by Jeremiah's quotation of the Lord, "Write ye this man childless" (Jeremiah, 22.30) and Rachiel's entreaty to Jacob, "Give me children, or else I die" (Genesis 30:1). God was the source of Infertility, closing the wombs of Sarah (Genesis 16:2) Hannah (1 Samuel: 6), Michael (2 Samuel 6:23), and the Women in Abimelech's house hold (Genesis 20:18), while opening up the wombs of Leah (Genesis 24:31) and Rachel (Genesis 30:22); and prayer remained man's principal resort for relief from infertility until he began to understand the physiologic factor in reproduction.

There were many gods and goddesses to which the early Greeks and Romans, men and women alike, appealed for help in performing their respective parts in the reproductive process. Not content with the aid of their divinities alone, however, they resorted to the urgic devices as well including magic formulas, songs and incantations, and the lying-on of hands.

The recognition of the principle of insemination is documented in the Hebraic Talmud in the first 30 years of the second century. The next reference is to an Arabian who, during the Arabian hegira in 1322, introduced a wad of wool into the vagina of his mare and left it overnight, the next night, under cover of darkness, he held the wool over the nostrils of a rival's prize stallion. With this stimulus the stallion ejaculated on a cloth held in readiness by the first practitioner of artificial insemination. The ejaculated material was then introduced into the vagina of the mare, which foaled after the appropriate length of time.

So long as the husband could perform the conjugal act, infertility in a marriage was ascribed to the wife. Male potency implied virility. Only

when coitus could not be consummated because of impotence or anatomic aberration was the husband's role in the reproductive process impunged. The obvious resort was artificial insemination. This was first attempted in 1680 without success by the Dutch anatomist Jan Swammerdam, with the eggs and sperm of fish. Ludwig Jacobi was successful in 1742. Not until 1780 was artificial insemination fruitful in mammals. In that year the Italian anatomist Lazaro Spallanzani impregnated a bitch with the semen of a dog. At about the same time, the illustrious John Hunter impregnated the wife of a man with hypospadias by vaginal injection of her husband's semen.

The next documented report, by Girault in 1833, of ten successful cases of insemination came out of France. In the 1850s Charles Pajot described a instrument called "Fecondateur" which was a syringe for artificial insemination in 1866. In 1866 the first publication in the United States on this procedure was published by James Marion Sims. His book, "Clinical Notes on Uterine Surgery," written during his stay in Europe, dealt at length with the management of sterility. In it he concurred in the prevailing, but mistaken, notions "that the ovum reaches the cavity of the uterus in from two to ten days after menstruation is the sign of ovulation; that it is preparatory to the reception of the ovum; that the ovum reaches the cavity of the uterus in from two to ten days after menstruation; and...that the uterus itself is the normal seat of conception." Despite these erroneous ideas, Sims succeeded in one of his numerous attempts at artificial insemination.

In this volume Sims also reported his studies of sperm survival in the vagina and cervical mucus. His staid British colleagues were shocked, however, by such invasion of the nuptial chamber by a physician; and the "medical Times and Gazette" castigated him in its review of the book:

I do not hesitate to say... that all mental, or moral, or hygienic or medicinal influences are ignored. With regard to the discovery of the total expulsion of the fertilizing liquid from the vagina, and to the dabblings in that canal with speculum and syringe under the circumstances described, we can but express our unfeigned regret that Dr Marion Sims has thought proper to found an odious style of practice on such (im) pure assumption. At any rate, if such practices were to be considered the "business of the Physician", there are a good many of us who would quit Physics for some other calling that would let us keep our sense of decency and self respect. Better let ancient families become extinct that keep up the succession by such means.

On a later page of a same journal a contributor twitted Sims in verse:

"Say, what is man? An atom at the first,
Waiting its nuptial atom in the womb;
Too oft, alas by fate untimely curst,
In place of fostering home, to find a tomb
Grieved at the thought, a tear thine eye bedims,
Great son of Aesculapius, Marion Sims.

Sims, should these fail, thou still wilt cherish hope,
To find some other cause that breeds the ill,
With learned digit, searching microscope,
or peering speculum, exploring still;
Nay, wizard-like, ethereal sleep wilt shed,
To win thy point, e'en o'er the nuptial bed."

In 1890 Robert L. Dickinson, in the greatest of secrecy, started using artificial donor insemination (AID) in the USA. Since then the procedure has been documented in ever increasing numbers; it has been discussed ad nauseam in journals of psychiatry, law, medicine, and religious pamphlets, as well as several textbooks devoted exclusively to artificial insemination.

2

Spermatogenesis, Sperm Maturation and Sperm-Oocyte Interaction in Human

Pradeep K Warikoo

INTRODUCTION

This chapter presents a brief overview of the spermatogenesis, in human, related sperm physiology and finally describes sperm-egg interaction. Knowledge acquired in this chapter will lead to a better understand of the modality taken in diagnosing and the therapeutic procedures employed in the treatment of infertility using intrauterine insemination. Past information together with latest findings in human gamete development and interaction will give you an understanding in how to modify sperm processing, treatment with various sperm motility enhancers or for that matter selecting a perfectly normal morphology sperm population for intrauterine insemination (IUI). Main players in spermatogenesis can be classified as a) male germ cell, b) sertoli cells, c) leydig cells, d) endocrine control.

PARTICIPANTS IN SPERMATOGENESIS

Spermatogenesis is a highly efficient and organized sequence of molecular and cellular events, that results in the production of spermatozoa from stem cells according to the defined time schedule.[1] The testis consists of an interstitial compartment containing leydig cells, blood vessels, lymphatic vessels and two to three layers of fibroblast-like cells surrounding the seminiferous tubules. In an adult testis there are >500 seminiferous tubules[2] containing stratified germ cells and sertoli cells (Fig. 2.1). Within the tubules, somatic sertoli cells create two regions: a basal compartment containing early germ cells which opens directly to the blood vessels and an adluminal compartment containing the more advanced germ cells separated from the blood vessels by a permeability barrier also known as blood testis barrier. An endocrinologically active testis