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Obstetrics & Gynecology

VOLUME 11



Dasgupta's Recent Advances in Obstetrics and Gynecology

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Contents

1. Preterm Labor **1**

Pratap Kumar

- Learning Objectives *1*
- Major Causes of Preterm Birth *1*
- Latest International Guidelines *2*
- Prevention *2*
- Terminologies *2*
- Contraindications to Stop Labor *2*
- Indicated Preterm Birth *3*
- Diagnosis *3*
- RCOG Recommendation *7*
- Delivery Management *7*

2. Induction of Labor **9**

S Shanthakumari, Shraddha Agarwal

- Definition *9*
- Indications *9*
- Contraindications *10*
- Prerequisites *10*
- Timing of Induction *10*
- Cervical Ripening *11*
- Methods of Cervical Ripening and Induction of Labor in Unfavorable Cervix *12*
- Induction of Labor with a Favorable Cervix *13*
- Monitoring during Induction of Labor *16*
- Pain Relief after Induction *16*
- Complications *16*
- Failed Induction *17*

3. Current Practice of Cesarean Section **20**

Rajkumar H Shah, Mohan A Gadam

- Overview *20*
- Changing Trends in Indications for Cesarean Section *20*
- Technique of Performing Cesarean Section *22*
- Delivery of Fetus *25*
- Placental Extraction *26*
- Exteriorization of the Uterus *26*
- Suturing of Uterine Incision *27*
- Prevention of Adhesions *28*
- Abdominal Closure *29*

4. Obstetric Hemorrhage **32**

Parag Biniwale, Pankaj Sarode

- Communication *34*
- Resuscitation *34*
- Monitoring and Investigations *35*
- Arresting of Blood Loss *35*
- Surgical Measures *35*

5. Diabetes in Pregnancy **39**
Pratik Tambe, Ameya Purandare
- Background *39*
- Obstetric Implications and Long-term Consequences *40*
- Screening and Diagnosis *40*
- Screening Methodologies *41*
- Summary of Recommendations on Screening *42*
- Benefits of Instituting Treatment *42*
- Monitoring Response to Therapy *43*
- Role of Diet and Exercise *44*
- Pharmacological Treatment *45*
- Fetal Assessment *48*
- Timing and Mode of Delivery *48*
- Management in Labor *49*
- Macrosomia and Shoulder Dystocia *49*
- Postpartum Follow-up and Counseling *51*

6. Polycystic Ovary Syndrome **55**
N Sanjeeva Reddy, Radha Vembu
- Diagnostic Criteria *55*
- Pathophysiology *56*
- Clinical Features *57*
- Clinical Signs *59*
- Ultrasound Features *59*
- Management *60*
- Polycystic Ovary Syndrome and Pregnancy *67*
- Polycystic Ovary Syndrome and Menopause *67*
- Adolescent Polycystic Ovary Syndrome *67*

7. Current Concepts in Ovulation Induction **72**
Nandita Palshetkar, Rohan Palshetkar, Jiteeka Thakkar
- Background *72*
- Treatment Strategies and Goals *72*
- Clomiphene Citrate *72*
- Tamoxifen *74*
- Adjuvant Regimens *74*
- Cochrane Meta-analysis *77*

8. Preimplantation Genetic Testing **80**
Hrishikesh Pai, Rushika Mistry
- Background *80*
- Definitions *80*
- Indications *81*
- Genetic Abnormalities that can be Detected Using PGT *81*
- Genetic Analysis Techniques Available for Testing *82*
- Process *83*
- PGT Regulations in India *86*

9. Ovarian Tissue Cryopreservation **89**
Vineet Mishra
- Background *89*
- Ovarian Cryopreservation: A Novel Option for Fertility Preservation *89*
- Techniques in Ovarian Tissue Cryopreservation *90*
- Methods of Cryopreservation *91*
- Thawing/Warming and the Risk of Recrystallization *92*
- Ovarian Tissue Transplantation *93*

10. Laparoscopic Cervicopexy **96**
Aswath Kumar, Chaithra TM, Sandip Datta Roy
- Apical Prolapse: Uterine Descent/Vault Prolapse *96*
- Current Treatments for Pelvic Organ Prolapse (NICE–Guidelines 2018) *96*
- Laparoscopic Sacrocervicopexy *97*
- Laparoscopic Pectopexy *100*
- Pectopexy versus Sacrocervicopexy *101*
- Laparoscopic Modified Khanna's Sling Procedure *101*

11. Screening for Breast Cancer **109**
Karishma Kirti, Nita S Nair
- Screening in Breast Cancer *109*
- Available Modalities for Screening *110*
- Effectiveness of Screening *118*

Index *123*

CHAPTER

2 Induction of Labor

S Shanthakumari, Shraddha Agarwal

"Giving birth should be your greatest achievement and not your greatest fear"
—Jane Wiedeman

INTRODUCTION

In the present scenario when there are rising cesarean rates and every woman and doctors want zero complications for mother and baby, we need to revive good techniques for the induction of labor so that the patients who are losing faith on doctors can be given utmost care with lots of patience during induction achieving a normal delivery.

DEFINITION

Induction of labor is defined as the technique of artificially stimulating the uterus to start labor pains. Induction of labor is carried out worldwide for a broad range of maternal and fetal indications, so as to improve pregnancy outcomes.

INDICATIONS

- Prolonged pregnancy (>41 weeks)
- Oligohydramnios
- Gestational hypertension >38 weeks
- Maternal medical condition refractory treatment
- Preterm rupture of membranes
- Prelabor rupture of membranes at term
- Presence of fetal growth restriction
- Alloimmune disease (at or near term)
- Chorioamnionitis
- Uncomplicated twin pregnancy ≥38 weeks
- Previous history of intrauterine demise (IUD)
- Intrauterine fetal demise
- Diabetes mellitus
- Intrauterine growth restriction.

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CONTRAINDICATIONS

- Placenta or vasa previa
- Umbilical cord presentation
- Transverse lie or footling breech
- Prior classical or inverted T uterine incision
- Significant prior uterine surgery (e.g. full thickness myomectomy, transfundal uterine surgery)
- Active genital herpes
- Pelvic structural deformities associated with cephalopelvic disproportion
- Invasive cervical carcinoma
- Previous uterine rupture
- Previous pelvic surgeries like vesicovaginal fistula/rectovaginal fistula/pelvic floor repair (third or fourth degree perineal tears repair), trachelorrhaphy.

Induction of labor should not be routinely offered in:

- A diabetic woman with suspected macrosomia
- Convenience of patient or care provider when there is no indication for induction of labor.

PREREQUISITES

- Informed and written consent
- Review of maternal history and profile
- Evaluation for indications and rule out any contraindications
- Reliable estimation of gestational age (by earlier scans), presentation, and fetal weight
- Maternal pulse, blood pressure, temperature, respiratory rate, and findings on abdominal palpation must be recorded
- Evaluation of baseline fetal heart rate pattern by auscultation/electronic fetal monitoring [Cardiotocography (CTG)]
- Maternal pelvis assessment and clinical evaluation for possible cephalopelvic or fetopelvic disproportion.

TIMING OF INDUCTION

- According to the Cochrane review 2012, it is recommended to induce women with uncomplicated pregnancies at or beyond 41 weeks.
- In case of term prelabor rupture of membranes, incidence of chorioamnionitis and endometritis and neonatal sepsis is reduced if labor is induced.
- In cases of previous cesarean section, rates of repeat cesarean section are reduced but risk of neonatal complications increases.

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- In cases of hypertensive disorders, more than 34 weeks of gestation, elective induction is associated with lower rate of complications.
- In cases of breech presentation, rate of cesarean section is high in induction group.
- In cases of uncomplicated twin gestation, there is no harm in induction beyond 37 weeks of pregnancy.

CERVICAL RIPENING

A ripened cervix is a boon for any obstetrician and her patient for inducing labor, so assessment of cervix is the very next step after confirming the indication for induction of labor.

Assessment of cervical status using Modified Bishop scoring system **(Table 1)** to predict the likelihood of success and select appropriate method of induction of labor.

Assessment of Bishop's Score

Total score = 13
Favorable score = 6–13
Unfavorable score = 0–5
A score of <5 suggests further ripening is needed, while a score of 9 or greater suggests that ripening is complete.
One point is added to the total score for:

- Existence of preeclampsia
- Each previous vaginal delivery

One point is subtracted from the total score for:

- Postdated/post-term pregnancy
- Nulliparity (no previous vaginal deliveries)
- *PPROM*: Preterm premature rupture of membranes.

TABLE 1: Modified Bishop Score.

Cervix	*Score*			
	0	*1*	*2*	*3*
Cervical dilatation	0	1–2	3–4	<1
Cervical length (cm)	>4	2–4	1–2	<1
Station of presenting part (cm in relation to ischial spine)	-3 or above	-2	-1, 0	+1, +2
Consistency	Firm	Medium	Soft	
Position	Posterior	Midposition	anterior	

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METHODS OF CERVICAL RIPENING AND INDUCTION OF LABOR IN UNFAVORABLE CERVIX

Cervical ripening refers to the softening of cervix that typically begins prior to the onset of labor contractions and is necessary for cervical dilatation and the passage of the fetus. It is the result of realignment of collagen, degradation of collagen cross-linking due to proteolytic enzymes, and uterine contractions. There is an increase in prostaglandin E2 (PGE2) in the cervix, which leads to dilatation of small vessels in the cervix, increase in collagen degradation, increase in hyaluronic acid, and many more events like increase in PGF2-alpha, which leads to increase in glycosaminoglycans.

Induction of Cervical Ripening

Cervical ripening allows uterine contractions to effectively dilate the cervix. The amount of uterine pressure required to dilate a ripe cervix is thought to be approximately 1,600 mm Hg as compared to 10,000 mm Hg required for an unripe cervix.

There are various methods:

Prostaglandins

- *Prostaglandin E2*: Two forms are available commercially in our country.
  - Cerviprime, which comes in the form of gel and is placed inside the cervix but not above the internal os. The application (3 g gel/0.5 mg dinoprostone) can be repeated in 6 h, not to exceed three doses in 24 h.
  - Propess (Dinoprostone vaginal pessary), which comes in the form of mesh and contains dinoprostone 10 mg is placed in the posterior fornix of vagina which allows controlled release of dinoprostone over 24 h, after which it is removed. Controlled release of dinoprostone minimizes the risk of hyperstimulation in comparison to intracervical or intravaginal gels as the pessary can easily be removed when labor starts or at the onset of any adverse event. Single dose is needed and easy to insert in OPD itself.

  Combination of oxytocin and PGE2 results in increased chances of vaginal deliveries within 24 h.
- *Prostaglandin E1 (Misoprostol)* is a synthetic prostaglandin, 25 μg can be crushed and placed on the cervix. It is effective in cervical ripening and labor, and the application can be repeated every 4 hours. The major risk of the use of misoprostol is hyperstimulation soothe woman and fetus must be monitored for contractions, fetal well-being, and changes in cervical Bishop score. It should not be used in cases of previous cesarean section or major uterine surgery.

  Combination of oxytocin induction preceded by a misoprostol induction is safe and shortens induction-to-delivery time.

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Low Dose Oxytocin Infusion

Dose of oxytocin from 1 to 4 mU/min is comparable to intravaginal misoprostol used for cervical priming.

Balloon Catheter

A 30–50 mL Foley's catheter filled with saline is effective in inducing cervical ripening and dilatation. The balloon is placed in the uterus, which causes direct stress in the lower uterine segment and cervix and results in the release of local prostaglandins. The PROBAAT trial compared the effectiveness and safety of induction of labor using a Foley's catheter with induction using vaginal prostaglandin E2 gel and found that in women with unfavorable cervix at term, results were similar.

Membrane Stripping

Manual separation of the amniotic membranes from cervix is thought to induce cervical ripening and the onset of labor. Authors of a Cochrane database review concluded that this practice provides no clinically important benefits.

Other methods:

- Hygroscopic dilators (laminaria tents), mifepristone, nitric oxide donors, relaxin, hyaluronidase or breast nipple stimulation are presently not recommended for induction of labor in view of the availability of low quality evidence for their use.

INDUCTION OF LABOR WITH A FAVORABLE CERVIX

Nonpharmacological Methods

- Mechanical dilators like 18F Foley's catheter is used widely for induction of labor. The Foley's catheter is inserted into cervical os and balloon is inflated with saline, then it is pulled and traction is given to facilitate the stretching of internal os. The Foley's catheter is left in situ for 12–24 h. A Cochrane review of 71 studies showed that the use of mechanical dilators had similar efficacy of vaginal delivery with similar cesarean section rates and minimal uterine hyperstimulation as compared to prostaglandins.
- Hygroscopic dilators like laminaria tents derived from seaweed are not used nowadays.
- Amniotomy:
  - A simple and effective method when the membranes are accessible and the cervix is favorable. It creates a commitment to delivery.[1]
  - Flow of amniotic fluid should be controlled with vaginal fingers. The liquor should be drained slowly because sudden decompression of uterus can lead to placenta abruption.

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- Care should be taken when amniotomy is done in unengaged presentation because there is a risk of cord prolapse. The vaginal fingers should not be removed until presenting part rests against the cervix.
- Amount and color (meconium or blood stained) of the liquor is observed.
- Monitoring of fetal heart should be done during and after the procedure.
- Oxytocin should be commenced immediately after amniotomy or after 2 hours depending on the intensity of uterine contractions.

There is not enough evidence as per Cochrane review 2000 to suggest that amniotomy alone is an efficacious method to induce labor.[2]

- *Membrane sweeping and stretching*: It involves introducing a finger under aseptic conditions in cervix beyond internal os and sweeping through the uterus circumferentially which results in release of PGF2 alpha and initiation of uterine contractions.[3] A Cochrane review of 22 studies of 2,797 women showed that membrane stripping at term reduced the rate of formal induction of labor at 41 weeks. There were no maternal side effects of the procedure. However, it is not recommended method for Rh incompatible pregnancy for fear of Rh isoimmunization.
- *Nipple stimulation*: Releases oxytocin and helps in the stimulation of labor.

Pharmacological Methods of Induction of Labor[4-7]

- *Prostaglandins*: They have the dual advantage of increasing uterine smooth muscle contractility and cervical ripening.[8]
  - *Prostaglandin E2 or dinoprostone*: It initiates uterine contraction and is available as 0.5 mg gel and 10 mg vaginal pessary.[9] Comparable outcomes are found between the Foley's and prostaglandin E2 for mean induction time and cesarean section rate; when compared with *misoprostol* and prostaglandin E2 takes longer time to achieve active phase, a longer induction time, and higher risk for cesarean section. Oxytocin can be started 30 min after the removal of a dinoprostone insert and 6 h after gel. Fetal heart and uterine activity should be monitored after 30 min to 2 h after insertion.
    - Side effects include transient fall in blood pressure, nausea and vomiting, and fever.
    - Caution in needed in women with glaucoma, severe hepatic and renal function and asthma.
  - *Prostaglandin E1 (misoprostol)*: Evidence shows that misoprostol is safe and effective agent for labor induction with intact membranes and on an inpatient basis. It is more effective than PGE2 to achieve vaginal delivery and results in less epidural use but more uterine hyperstimulation. Oral and vaginal routes have a similar reduction in cesarean section rates. The lower vaginal dose 25 μg tends to need more oxytocin stimulation

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than the high vaginal dose (>50 μg). Electronic fetal monitoring should be performed for 30 min after administration of misoprostol and for 60 min after any tachysystole. Network meta-analysis 2016 found that the misoprostol might be the best prostaglandin for labor induction. It should not be used in the setting vaginal birth after cesarean section due to increased risk of uterine rupture. Oxytocin should be started after 4 hours of last dose of misoprostol.

- *Oxytocin*
  - Intravenous oxytocin is the most commonly used method of induction for women with a favorable cervix (Modified Bishop Score >6).
  - Oxytocin can be used alone, in combination with amniotomy, or following cervical ripening. It can be used for induction as well as augmentation of labor.
  - It should be used with caution in women with previous cesarean delivery and grand multiparous women because of the risk of uterine rupture.
  - Oxytocin should be administered intravenously as an infusion to allow continuous, precise control of the dose administered.
  - The low-dose regimen begins with 1–2 mU/min, increased incrementally by 1–2 mU at every 30 min intervals.
  - The high-dose regimen starts with 4–6 mU/min with dose increments of 4–6 mU/min every 15–30 min.
  - High dose protocols reduce the induction delivery interval and are associated with higher rates of tachysystole than low dose protocols. Maternal and fetal complication rates are similar with both protocols.
  - The oxytocin infusion can be increased until labor progress is normal or uterine activity reaches 200–250 Montevideo units (i.e., good regular uterine contractions, each lasting for 40–45 seconds duration and minimum of three contractions in 10 minutes.
  - Monitoring for infusion rate of oxytocin and uterine contractions and fetal heart rate by continuous cardiotocography is preferable method.
  - Blood pressure and pulse should be assessed every hour. Intake and output should be assessed every 4 hours. The frequency, intensity, and duration of uterine contractions should be assessed every 30 minutes and with each incremental increase in oxytocin.
  - Cervical status should be assessed prior to administration of oxytocin and repeated after at least 4 hours of moderate contractions.
  - A vaginal examination may also be repeated in situation of a nonreassuring fetal heart pattern to rule out the presence of meconium, abruption or a cord accident.
  - Close watch is kept for clinical features of maternal hyponatremia, uterine hyperstimulation, and uterine rupture.

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- Oxytocin is administered as dilute solution by intravenous route. Isotonic solutions such as ringer lactate or normal saline are preferred over dextrose solution for fluid selection to minimize the risk of electrolyte imbalance (e.g. hyponatremia) and volume overload.
- 2 mL of oxytocin (two ampoules) is taken in a 10 mL syringe and diluted with 8 mL of normal saline. It makes 10 mL of saline solution having 10 units of oxytocin. One mL of this saline solution contains one unit of oxytocin. To make a bottle of two units of oxytocin infusion, 2 mL of this solution is added in 500 mL of Ringer lactate.[10,11]

MONITORING DURING INDUCTION OF LABOR

- Before induction of labor, a nonstress test is recommended.
- Intermittent maternal and fetal (fetal heart rate) monitoring should be done every hour initially.
- Continuous electronic/more frequent intermittent fetal heart rate monitoring should be started in active labor.
- Progress of labor is monitored using partogram.
- Close watch is kept for temperature, pulse rate, blood pressure, fetal heart pattern, vaginal bleeding, uterine hyperstimulation, uterine rupture, and scar dehiscence in women with previous cesarean delivery.

PAIN RELIEF AFTER INDUCTION

- Women should be provided pain relief appropriate for them after counseling. This can range from simple analgesics to epidural analgesia.
- Women should be encouraged to use breathing and relaxation techniques in labor.
- There is no need to wait for labor analgesia arbitrarily till the cervical dilation has reached 4–5 cm.
- If regional analgesia is planned, the woman should be informed about the risks and benefits and the implications for her in labor.

COMPLICATIONS

- *Uterine hyperstimulation*:
  - First step is to discontinue oxytocin infusion or withdraw dinoprostone vaginal pessary.
  - Tocolytics preferably betamimetics are recommended for women with uterine hyperstimulation during induction of labor. Contraindications of betamimetics especially cardiac disease should be kept in mind.
  - If associated with abnormal fetal heart pattern, decision for cesarean section is taken.

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- *Uterine rupture*:
  - Rupture can occur in both scarred and unscarred uterus and is associated with multiparity, malpresentation, unsupervised or aggressive use of uterotonics.
  - A close watch is kept on maternal signs and monitoring is done for fetal heart rate abnormality.
  - In suspected case of uterine rupture or scar dehiscence, delivery is by emergency cesarean section.
- *Uterine atony*:
  - Postpartum atony and hemorrhage are more common in women undergoing induction or augmentation.
  - Increased risk of cesarean section
  - Chorioamnionitis.

FAILED INDUCTION

It means that the latent phase has continued for an extended length of time and after clinical assessment, it is unlikely that active phase will be reached to achieve a successful vaginal delivery.[12]

Failed induction of labor must be differentiated from failure of progress of labor (prolonged active phase, prolonged second stage, nonreassuring fetal status). Latent phase of labor of cervical ripening is excluded from diagnosing failed induction.

The definition in case of prostaglandins is "failure to induce progressive labor after one cycle of treatment" consisting of the insertion of two vaginal PGE2 tablets (3 mg) or gel (1–2 mg) at 6 h interval or one PGE2 controlled released pessary (10 mg) over 24 h.

- Maternal and fetal well-being should be reassessed.
- Subsequent management options are: Another attempt to induce labor with a different method can be considered after discussion with the patient but it depends on the nature and urgency of the clinical situation (indication of the induction of labor) cesarean delivery.

CONCLUSION

Induction of labor should only be offered when there is clear medical indication and benefits for the mother and baby outweigh its potential harms, and this requires careful consideration of the clinical evidence in discussion with the woman.

"You are a birth servant. Do good without show or fuss. If you must take the lead, lead so that the mother is helped, yet still free and incharge. When the baby is born, they will rightly say; we did it ourselves!. " TaoTe Ching

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Consent Form

I (Name of the patient) wife of Sh. (Name of the husband) ID No: .... have read the above document and have understood the need for the proposed procedure. The indication, possible complications and need for further procedure in case of failure of the induction of labor have been explained to us by our doctor (Name of the doctor). I have been given the opportunity to ask questions and clarify my doubts. I hearty give my full consent to undergo the procedure. I understand the risk involved.
Procedure (specify the method of induction of labor):

Indication:

Time and date:

Place:

Name and signature of the patient — Name and signature of the attendant

Name and signature of the doctor — Name and signature of the witness

Check List

Method used for the patient: .....

Name of patient: ..... w/o: .....

ID No. .....; Date: .....; Time: .....

- Age (Date of birth): ..... years; Gravida and parity: .....
- LMP (last menstrual period): .....
- Expected date of delivery: .....
- Corrected expected date of delivery: .....
- Gestational age by LMP: .....
- Gestational age by first ultrasound (done before 20 weeks of gestation): ... .
- History of any allergies, medical condition, special need: Yes/No
- High risk review: Yes/No
- Indication for induction reviewed: Yes/No
- Planned method of induction: Yes/ No
- Consent form signed by the patient and her attendant: Yes/No
- Fetal heart rate assessment: Yes/No
- Pre-induction modified Bishop's score:

Total score of patient: — Favorable score and unfavorable score

Signature of doctor: — Date and time:

Name of doctor:

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Dasgupta's **Recent Advances in**
Obstetrics and Gynecology

The Recent Advances in Obstetrics and Gynecology is scheduled to be the second volume in an ongoing series, which seeks to address a much felt lacuna in postgraduate teaching. Aimed primarily at postgraduate students and residents, this book is a collection of focused articles from much sought after teachers and authors who bring decades of experience and expertise in their respective fields.

Typically, students only receive a short period of study leave prior to the examinations during which, precious time is lost scouring for resources and locating updated guidelines, research papers and evidence on topics of thematic interest. Hence, the authors address this paucity with this textbook series, which aims to unite senior, respected and stalwart postgraduate teachers from all over India who have been mentors and guides to generations of students. Each chapter focuses on traditional concepts as well as the most modern updated evidence on the issues at hand.

The book will be a useful compendium for postgraduate students and readers who wish to keep themselves updated with the latest evidence.

Nandita Palshetkar MD FCPS FICOG FRCOG (UK) is a Professor of Obstetrics and Gynecology, Dr DY Patil Medical College, Hospital and Research Center, Navi Mumbai. She is the President of the Federation of Obstetric and Gynaecological Societies of India (FOGSI)-2019 and has been the Past President of the Mumbai Obstetric and Gynecological Society (MOGS), Indian Association of Gynaecological Endoscopists (IAGE) and Maharashtra Chapter of ISAR (MSR). She is the President Elect for the All Maharashtra Association of Obstetric and Gynaecological Societies (AMOGS) and heads the IVF unit at Lilavati and Bhatia Hospitals, Mumbai; DY Patil Medical College, Navi Mumbai; Fortis Hospitals, New Delhi, Gurugram and Chandigarh. Widely considered as a pioneer in ART and responsible for offering the latest laboratory advances in the field to Indian patients, her passion for medicine in general and assisted reproduction in particular is well known. She has written over 100 textbook chapters, edited several books and has been the recipient of 18 national and international awards including the Bharat Gaurav Award at the House of Commons in the UK. Most recently, she has been conferred the Fellowship of the Royal College of Obstetricians and Gynaecologists (UK) is honoris causa.

Pratik Tambe MD FICOG is an ART Consultant and Gynecology-Endoscopic Surgeon. He holds a Diploma in Advanced Laparoscopic Surgery from France and has trained in Assisted Reproduction in Belgium and Clinical Embryology in the UK and Singapore. He is currently the Chairperson, FOGSI Endocrinology Committee and a Managing Council Member of the Mumbai Obstetric and Gynecological Society (MOGS). He has served as a Managing Council Member for AMC, MSR and IAGE and been a mentor for the MOGS Youth Council for many years. He is a peer reviewer for the Journal of Obstetrics and Gynecology of India and has edited 7 books, 2 FOGSI Focuses, several series of newsletters and contributed numerous articles and chapters to several publications country-wide. He has organized over 300 CMEs nationwide and spoken on more than 500 occasions at national and international events. He has been a recipient of 14 MOGS, 5 FOGSI Prizes and Awards and 9 Best Scientific Paper Presentation prizes including the MOGS Dr NA Purandare Prize, MOGS Dr SD Upasani Prize (twice), MOGS Dr Duru Shah Best Committee Member Award (thrice), FOGSI Dr CS Dawn Prize, FOGSI Dr Kumud Tamaskar Best Thesis Prize, FOGSI Dr Nimish Shelat Research Award, the FOGSI Best Publication Award and the FOGSI Dr Mehroo Hansotia Best Committee Award, 2019.

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