Robot Assisted Surgery in Gynaecology

Bronchopulmonary Dysplasia

The Use of Anti-D Immunoglobulin in The Prevention of Rhesus Isoimmunisation

Bronchiolitis
Minimally invasive surgery in gynaecology has been slow to spread, with most developed countries achieving no more than 15% of hysterectomies done laparoscopically and 25% vaginally. Therefore, at least 60% of cases are still performed by open surgery and women are not offered the benefits of minimally invasive surgery. In experienced hands the open surgery figure can be reduced to less than 15% of cases.

The reason for this failure is multifactorial and includes inadequate training, difficulty in achieving an adequate skill level in conventional laparoscopy and the fact that many gynaecologists, in contrast to surgeons, have other subspecialties they focus on like ultrasound, infertility and fetal medicine. As a result, they do not have enough time or operate with adequate frequency to acquire advanced minimally invasive skills. Instead they continue to offer open surgery as a default. General surgeons on the other hand have embraced laparoscopy and it has become the standard for many procedures.

Robotic surgery was first introduced for gynaecology in 2005 and now offers an alternative minimally invasive approach for benign and oncological procedures including simple hysterectomy, myomectomy, severe deep infiltrating endometriosis, sacrocolpopexy and oncological procedures including radical hysterectomy and lymph node dissections.

Robotic surgery has three main advantages over conventional laparoscopy: an enhanced three-dimensional high-definition (3D HD) view, more precise instrumentation with much greater ranges of movement and superior ergonomics for the surgeon. Consequently, the benefits for the doctor are clear: surgeons have found that the technology allows them to acquire minimally invasive skills more easily. Adding 3D alone improves even an expert conventional laparoscopic surgeon’s ability by reducing errors and improving the speed taken to complete tasks. More precise instrumentation and less physical stress on the surgeon can only enhance these benefits further.

Newer robotic developments that are not available with conventional laparoscopy include:

- Infrared view technology to allow easier detection of lymph nodes and blood vessels.
- Incorporation of imaging results in the surgeon’s viewfinder including real-time ultrasound.
- Dimensional high-definition (3D HD) view, more precise instrumentation and less physical stress on the surgeon can only enhance these benefits further.

The main gynaecological conditions dealt with at SGH are:

**Radical Excision of Deep Infiltrating Endometriosis**

8% of women suffer from endometriosis and 10-20% of these have severe disease. Unfortunately the disease is often not recognised, or even worse only endometriotic cysts are removed and the underlying endometriotic lesions are left behind. This results in rapid recurrence of pain symptoms and a missed opportunity to optimise fertility.

The aim of surgical endometriosis surgery is to safely remove all visible lesions to optimise pain and fertility outcomes. The robotic service at SGH is linked to a Friday afternoon subspecialty Endometriosis Clinic that is suitable for both private and subsidised cases.

**Hysterectomy for menorrhagia and adenomyosis**

Many cases nowadays can be managed with hormonal manipulation however a substantial number still require a hysterectomy when conservative therapies fail. The average stay for robotic hysterectomy at SGH is 1-2 days. This is less than for all the other surgical treatment options for hysterectomy at SGH including conventional laparoscopy.

**Myomectomy for uterine fibroids**

Robotic surgery makes the technical aspects of minimally invasive myomectomy easier mainly due to the wristed instrumentation in robotics that allow easier dissection of fibroids and suturing the uterus. Therefore, within reason, more complex larger fibroid cases can safely be performed without the need for open surgery.

**Conclusion**

Robotics now offers the surgeon substantial advantages over conventional approaches that can be translated into benefits for gynaecological patients. The cost of a robotic procedure is higher than conventional laparoscopy and open surgery. However, as a result of a determination to offer the advantages of robotics to both private and subsidised cases, we are able to offer robotic surgery with very minimal requirement for out-of-pocket payments for Singaporeans of all patient classes.
Bronchopulmonary Dysplasia

There has been significant improvement in survival rates for very low birth weight infants <1500 grams (VLBW) in the past 20 years. Improvements in obstetric and neonatal care, including the use of prenatal betamethasone treatment, surfactant replacement therapy, judicious use of mechanical as well as non-invasive ventilator strategies, and optimisation of nutritional support have reduced neonatal mortality from extreme prematurity. However, bronchopulmonary dysplasia (BPD), also known as chronic lung disease of prematurity, continues to be a major contributor to morbidity in VLBW survivors. The Vermont-Oxford Network reports incidence rates of 60% in preterm infants weighing 501 to 750 grams at birth, 39% in infants weighing 750 to 1000 grams and 21% incidence in birth weights of 1001 to 1250 grams.

What is bronchopulmonary dysplasia?

In 2000, a National Institute of Child Health and Human Development (NICHD) led workshop proposed a severity based definition of BPD depending on the infant’s gestational age and need for oxygen therapy:

<table>
<thead>
<tr>
<th>Gestational Age</th>
<th>&lt;32 Weeks</th>
<th>≥ 32 Weeks</th>
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<tbody>
<tr>
<td>At Time Point of Assessment</td>
<td>≥36 weeks post menstrual age or discharge to home, whichever comes first.</td>
<td>≥56 days postnatal age or discharge to home, whichever comes first.</td>
</tr>
<tr>
<td>Mild BPD</td>
<td>Breathing room air</td>
<td>Breathing room air</td>
</tr>
<tr>
<td>Moderate BPD</td>
<td>Need for ≤ 30% oxygen</td>
<td>Need for ≤ 30% oxygen</td>
</tr>
<tr>
<td>Severe BPD</td>
<td>Need for ≥ 30% oxygen &amp;/or positive pressure</td>
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Radiological findings, while not essential in labelling of the disease, are helpful in appreciating the severity of BPD. Common findings include diffuse haziness and a coarse interstitial pattern of atelectasis, inflammation and/ or pulmonary oedema, low lung volumes, and areas of atelectasis that alternate with areas of gas trapping (Figure 1).

Aetiology And Pathophysiology

The aetiology of BPD is multifactorial and involves exposure to antenatal and/ or postnatal factors which disrupt pulmonary development, and may cause inflammation and damage to the highly vulnerable premature lung (Figure 2).

Prevention And Management

Infants with BPD may be managed at home on supplemental oxygen via an oxygen concentrator. The preferred method of administration is via a nasal catheter, which allows low flow rates to be used with minimal interference with other aspects of infant care. An appropriate home environment, social support with reasonable accessibility to medical care and close outpatient follow up and monitoring of respiratory function, growth and neurodevelopment is important.

Rsv Immunisation

Infants with BPD are susceptible to respiratory infections on discharge home. Respiratory syncytial virus (RSV) infections and other viruses may cause severe respiratory illness and even death. Palivizumab (Synagis) is a monoclonal antibody given monthly as immunoprophylaxis against RSV for up to a maximum of 5 doses. The current American Academy of Paediatrics guidelines suggests that infants born before 32 weeks gestation or infants born <32 weeks and having a requirement for >21% oxygen for at least the first 28 days after birth merit Palivizumab prophylaxis. It is also recommended that these infants receive Influenza vaccine after 6 months of life.

Anti-D antibodies usually develop as a result of fetomaternal haemorrhage (FMH) such as placenta abruption, miscarriage, and during childbirth in a rhesus negative women with a rhesus positive fetus. This process, where a mother develops antibodies against her own baby’s blood type is called alloimmunization (the older term was isoinmunisation). These antibodies may cause harmful sequelae to a baby in subsequent pregnancies by way of causing intrauterine fetal haemolysis. In severe cases, the fetus may become severely anemic in-utero resulting in fetal heart failure (hydrops fetalis) and intrauterine death. The prevalence of rhesus negative blood types varies among populations with the highest ethnicity being Basques (30-35%), Caucasians in North America and Europe (15%), India (5%) and Asia as a whole (0.3%). Prior to the development of anti-D immune globulin, approximately 16 percent of rhesus negative women became alloimmunized after two deliveries of rhesus positive infants. This rate fell to 2 percent with routine postpartum administration of a single dose of anti-D immune globulin and was further reduced to as low as 0.1 percent with the addition of routine antenatal administration in the third trimester. However, rhesus alloimmunization has not been eliminated. Reasons for continued occurrence of sensitized pregnancies is largely due to failure to administer anti-D immuneglobulin in accordance with published guidelines. Hence, it is important to stress the importance of use of anti-D immunoglobulin in order to prevent any possible rhesus isoinmunisation. In Singapore, the term Rhogam is often used in place of anti-D immunoglobulin. Rhogam is a commercial name for anti-D but many hospitals now use other brands. The term Rhogam remains in common use and fortunately most pharmacists know what we mean!
How to prevent and minimise rhesus immunisation?

Checking rhesus status in pregnancy is therefore mandatory as rhesus disease is preventable. This should be done in the first trimester. According to evidence-based guidelines, routine antenatal anti-D prophylaxis (RAADP) should be administered to rhesus-negative women (at 28 weeks only or 28 and 34 weeks, depending on the local regime). Anti-D Ig prophylaxis should be given to all non-sensitised rhesus negative women after potentially sensitising events during pregnancy such as invasive diagnostic test (amniocentesis, chorionic villus sampling), antepartum haemorrhage, external cephalic version (a procedure to turn a breech baby to cephalic), any abdominal trauma and fetal death. This should be in addition to any anti-D already received even if it has just been administered.

Who should receive prophylaxis?

Anti-D Ig should be given to all non-sensitised Rh-negative women who have a spontaneous complete or incomplete miscarriage at or after 12 weeks of gestation or if miscarriage happens regardless of gestation. However, it is not required if miscarriage happens before 12 weeks gestation provided there is no instrumentation of the uterus. Non-sensitised women should also receive recommended doses before 12 weeks gestation provided there is no instrumentation of the uterus. Non-sensitised women should also receive recommended doses before 12 weeks gestation provided there is no instrumentation of the uterus. Non-sensitised women should also receive recommended doses before 12 weeks gestation provided there is no instrumentation of the uterus. Non-sensitised women should also receive recommended doses before 12 weeks gestation provided there is no instrumentation of the uterus.

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What are the effects and fetal effects on RAADP?

There is no evidence to suggest that RAADP is associated with adverse events that are a consequence for the mother or baby, other than the possibility of blood-borne infection, and procedures are in place to minimise these risks.

How should anti-D Ig be administered?

For successful immunoprophylaxis, anti-D Ig should be given as soon as possible after the potentially sensitising event but always within 72 hours. If it is not given before 72 hours, every effort should still be made to administer the anti-D Ig, as a dose given within 10 days may provide some protection. Ideally, anti-D Ig should be administered into the deltoid muscle as injections into the gluteal region often only reach the subcutaneous tissues and absorption may be delayed. Women who have a bleeding disorder should receive anti-D Ig via the subcutaneous or intravenous route.

What is the mechanism of action of anti-D Ig?

The mechanism whereby anti-D immune globulin prevents alloimmunisation remains unproven. Possibilities include rapid macrophage mediated clearance of anti-D coated red blood cells. It is also suspected that anti-D may cause down-regulation of antigen-specific B cells before an immune response occurs hence preventing the mothers immune system from recognising that her baby has a different rhesus genotype.

Conclusion:

All rhesus negative pregnant women should undergo an antibody screen at the first prenatal visit. If the initial screen is negative, a routine repeat screen at 28 weeks of gestation is optional. The optimum recommended dose regimen for RAADP are:

- a) 1500 IU anti-D Ig at 28 weeks gestation OR
- b) 500 IU anti-D Ig at 28 weeks gestation and 34 weeks gestation
- c) At least 500 IU anti-D Ig within 72 hours following delivery

For antenatal prophylaxis, regimen (a) or (b) is acceptable. Postnatal prophylaxis (c) must be given to all rhesus negative women whose babies are rhesus positive. Strict adherence to this protocol will help make rhesus disease in babies a thing of the past.

Who should receive prophylaxis?

Anti-D Ig should be given to all non-sensitised Rh-negative women who have a spontaneous complete or incomplete miscarriage at or after 12 weeks of gestation and those who undergo surgical or medical evacuation, regardless of gestation. However, it is not required if miscarriage happens before 12 weeks gestation provided there is no instrumentation of the uterus. Non-sensitised women should also receive recommended doses of anti-D Ig during antenatal care (as above).

Indications for admission

1. Age less than 3 months
2. Evidence of respiratory failure
   a. Lethargy or altered mental status
   b. SpO2 <95% on room air
3. Significant respiratory distress despite initial treatment
4. Evidence of dehydration or history of poor feeding and/or vomiting
5. Poor social setup or parents being unable to cope

How do I recognise the sick child?

The diagnosis and assessment of a child with bronchiolitis is largely clinical, with limited role for radiographs and blood work. The initial assessment is directed at assessing the respiratory, perfusion and hydration status of the child.

Table 2: The red flags in a child with severe bronchiolitis

<table>
<thead>
<tr>
<th>Respiratory status</th>
<th>Circulatory status</th>
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<tr>
<td>Hypoxaemia (SpO2 &lt;90%)</td>
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Bronchiolitis

Background

Bronchiolitis is a lower respiratory tract infection affecting children less than 2 years of age. It is a major cause of paediatric outpatient and inpatient visits and is characterized by inflammation and oedema of the distal airways (bronchioles), excessive airway secretions and epithelial debris. Bronchiolitis is largely caused by viruses, the most common being the respiratory syncytial virus (RSV), rhinovirus, parainfluenzae and influenza viruses.

The initial symptoms of bronchiolitis include cough, rhinorrhea, and fever. This occasionally progresses to wheezing and respiratory distress with poor feeding in varying degrees of severity. Common auscultatory findings include crepitations, prolonged expiratory phase and expiratory ronchi.

Course of illness

In the majority of infants, the clinical course is self-limiting, requiring supportive care at the outpatient setting. These include anti-pyretic measures and adequate fluid hydration. The illness usually peaks on the 5th to 7th day, with significant improvement in the symptoms towards the end of the second week, and complete resolution by 28 days. Often, the cough may take more than 2 weeks to settle.

However, a small group of children are at higher risk for a more severe course of illness as well as apnoea and these are described in the table below. They should be monitored more closely, with a lower threshold for admission.

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<td>3. Hypoxiaemia (SpO2 &lt;90%)</td>
<td>4. Pulse oximetry&lt;90% at presentation</td>
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Table 1: Risk factors for bronchiolitis & apnoea

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Oxygen therapy should be initiated for children with a compromised respiratory status. This can be given via nasal prongs, hood box or a face mask. A trial of bronchodilators (nebulised adrenaline) may be useful in bronchiolitis, and the response should be assessed within the hour following bronchodilator administration. Intravenous fluids are indicated in children with signs of dehydration or haemodynamic compromise, or if the child is very breathless.

Following the initial therapy, the child should be monitored for clinical response. If there is no significant improvement, consideration should be made for inpatient care.
RSV Prophylaxis

There are several groups of infants who are at-risk of severe RSV infections, and RSV prophylaxis should be considered for them. Of note, premature infants who have bronchopulmonary dysplasia and chronic oxygen dependency in the neonatal period have significantly higher risks. Palivizumab, a humanised monoclonal antibody, has a role preventing severe RSV infections, thereby reducing morbidity, as well as hospital and intensive care unit admission rates. The group of infants who would have significant benefit for prophylaxis are listed in the table below.

### Indications for RSV prophylaxis

1. Preterm Infants less than 12 months of age who were born before 29 weeks gestation.
2. Preterm infants with bronchopulmonary dysplasia BPD.
3. Infants with haemodynamically significant congenital heart disease: acyanotic heart disease requiring medication for heart failure, moderate to severe pulmonary hypertension.
4. Prophylaxis may be considered in infants with anatomical pulmonary abnormalities, neuromuscular disorders or immune deficiencies.
5. Insufficient data exists to recommend prophylaxis in infants with Down’s Syndrome or Cystic Fibrosis.

Table 4: indications for RSV prophylaxis (AAP committee on infectious diseases and bronchiolitis guidelines committee, August 2014)

What do I tell the parents?

Anticipatory guidance for the parents is crucial to help them to manage their child, and understand when to return for a repeat assessment. Such advice includes explaining the expected course of the illness, proper technique of nasal suctioning, as well as indications to return for medical assessment.

### Anticipatory guidance for parents

1. Expected course of the illness (see above)
2. Technique of nasal suctioning: infuse saline drops into both nostrils, and suction with a suction bulb a few minutes thereafter
3. Indications for medical attention: apnoea, increasing respiratory distress, poor feeding, recurrent vomiting, lethargy or inconsolable agitation