

## Chapter 4

# Litigation in Infections of Obstetrics and Gynecology

### 4.1 Case 1: Fever in a Pregnant Female

*A 28-year-old female Native American Indian, in her third trimester of pregnancy (34 weeks), presented to an isolated, stand-alone medical center serving the local community (Indian Reservation) at 6 p.m. on a Sunday evening. This center serves the dual purpose of medical clinic and emergency facility. Available teleconsultation and transportation to a tertiary care center via air ambulance were accessible 24 h/day. Normally, air ambulance transfer to a distant tertiary care hospital can be accomplished within 3–4 h after notification by phone.*

*The patient presented with symptoms of fever, chills, and backache of 24 h duration, with more recent nausea, vomiting, and dizziness of 2 h duration. There was no significant past medical illness or allergies. Physical examination by the attending physician noted a blood pressure of 90/60 mmHg, pulse of 120/min, temperature of 39.5°C, and evidence of left costovertebral angle tenderness. Urinalysis showed many leucocytes and positive nitrates and a diagnosis of acute pyelonephritis was made. The patient was kept overnight in the medical center, and she was started on intravenous saline and gentamicin 60 mg every 8 h, after obtaining urine and blood cultures. The patient's weight was estimated to be about 65 kg. Two hours later the patient was stable with a blood pressure 100/70 pulse 120/min and temperature of 38.5°C.*

*The incoming physician starting the next shift at 7 a.m. the following morning was notified about the patient. At 9 a.m., when the new physician got around to the patient, she was found to be diaphoretic, toxic looking, with a systolic blood pressure of 70, pulse 150 min, weak in volume, cold cyanosed periphery, and respiratory rate of 40 min. There was no record of monitored vital signs in the preceding 12–14 h. An immediate arrangement for air-ambulance and transfer to the hospital was implemented. Increased volume of intravenous saline was given and another dose of gentamicin at 100 mg. The patient arrived at the tertiary care hospital within 3 h, and was found to be in septic shock. She subsequently lost the baby, and developed bilateral gangrene of the lower legs, which required amputation. She survived the surgery. Initial urine and blood cultures grew *Escherichia coli* fully sensitive to the usual antibiotics.*

### **4.1.1 Medico-legal Issues**

The lawyer for the plaintiff filed litigation against the two physicians involved in the case and the medical center. Against the first physician, the claims were of negligence for not arranging transfer to a hospital from the night before, as the patient had a complicated urinary tract infection in pregnancy. Moreover, when the patient was seen, the dosage of gentamicin used was inadequate to treat sepsis, and there was no monitoring of the vital signs throughout the night.

With respect to the second physician, he was charged negligent for the delay in assessing an ill patient. He knew the patient was admitted to the medical center, but did not assess her condition until 2 h after his arrival at the medical facility. The actions and decisions of both physicians, as claimed by the plaintiff, resulted in fetal loss, and indirectly, ischemic gangrene of the lower limbs that resulted in amputation. Compensation was thus being sought for injury to the mother and fetus, and life-long disability of the mother, which will affect her functioning and employability.

Liability claims against the medical center (run by the Provincial Government) was for failure to provide adequate prenatal care, as the employees or healthcare workers did not perform routine midstream urine (MSU) for culture in pregnancy. Furthermore, during the overnight admission, the nurse on duty should have been checking the patient's vital signs at regular intervals.

The defendants' legal defense responded that the physicians' actions were not negligent and they acted in good faith and appropriately, considering the limited resources available to them. Furthermore, even if a transfer to the tertiary care hospital were made earlier, it probably would not have affected the outcome. Moreover, the second physician was not aware that the patient was very ill and he was occupied seeing emergency patients waiting soon after his arrival at the facility.

### **4.1.2 Medical Issues**

Urinary tract infections are the most common medical complications of pregnancy. These may be asymptomatic (asymptomatic bacteriuria of pregnancy) or symptomatic with cystitis or acute pyelonephritis. Studies performed in 1960 identified persistent asymptomatic bacteriuria in 6% of prenatal patients, and 40% of these patients would develop acute pyelonephritis when the bacteriuria was not eliminated.<sup>1,2</sup> Neonatal death rates and prematurity were noted to be two to three times greater in untreated bacteriuric women compared to those when the bacteriuria was eliminated.<sup>3,4</sup> However, the association between bacteriuria and prematurity and low birth weight infants has been controversial.

It has long been recognized that symptomatic urinary tract infection is more common in pregnant than non-pregnant women. Several factors are believed to play a role. The upper ureter and renal pelvices become dilated, resulting in a

physiologic hydronephrosis of pregnancy. This is a result of effects of progesterone on muscle tone and peristalsis on the urinary collecting system, and the mechanical obstruction by the enlarged uterus. There is also decreased bladder tone, increased capacity, and incomplete emptying of the bladder, all factors that predispose to vesicoureteric reflux. The hypokinetic collecting system reduces urine flow and predispose to ascending infection from the bladder to the kidneys.<sup>5</sup>

Acute pyelonephritis is one of the most serious complications in pregnancy and is a threat to maternal and fetal well being. Several studies have confirmed the association between acute pyelonephritis and the increased risk of premature delivery.<sup>6–10</sup> The association of acute pyelonephritis and preterm delivery was known from the pre-antibiotic era with prematurity rates of up to 20–50%.<sup>5</sup> The proposed mechanisms include oxytocic-like effect of endotoxin on the myometrium causing uterine contractions; high fever by pyrogens may increase myometrial activity, uterine contractions may result in reflex myometrial contractions, and the endotoxin may cross the placenta and produce fetal effects resulting in premature labor. Asymptomatic bacteriuria alone probably has no harmful effects unless it leads to symptomatic pyelonephritis.

The incidence of persistent asymptomatic bacteriuria in pregnancy varies from 2% to 7% and depends on parity, race, and socio-economic status. The highest incidence of asymptomatic bacteriuria is in African-Americans with sickle cell trait, and the lowest incidence is in affluent white women of low parity.<sup>11</sup> It is usually the same group of non-pregnant who has asymptomatic bacteriuria, but is prone to episodes of intermittent cystitis. The patient in the present case report would fall into the higher risk group for persistent bacteriuria.

Acute pyelonephritis during pregnancy occurs more frequently in the second trimester, and multi-parity and young ages are associated risk factors.<sup>12</sup> It can also occur during the third trimester and early post-partum, but there does not appear to be a significantly increased risk in the first trimester. Bacteremia occurs in 15–20% of women with acute pyelonephritis, and the sepsis syndrome is common.<sup>11</sup> Kidney infection was the second most common reason for non-delivery admission, 4 per 100 in one study of 833,264 hospitalizations for pregnancy complications.<sup>13</sup> Admissions for preterm labor (33%) were the most common reason for hospitalization, followed by genito-urinary infections (16%). In another survey of 46,179 pregnancies, 3.5% required antepartum admission for acute pyelonephritis.<sup>14</sup> Urosepsis also is the leading cause of septic shock in pregnancy, predominantly due to *E. coli*.<sup>15</sup> Over a 2-year audit at the Parkland Hospital Obstetrics intensive care unit, 12% of the admissions were for sepsis syndrome caused by acute pyelonephritis.<sup>16</sup> The overall incidence of acute pyelonephritis in pregnancy is about 1–2.5%, with an estimated recurrence rate of 10–18% during the same gestation.<sup>5</sup> Asymptomatic bacteriuria is the major predisposing factor and others include obstructive uropathy, neurologic disease, renal calculi, and the need for catheterization. Screening and treatment of asymptomatic bacteriuria decreases the risk of pyelonephritis significantly in pregnant patients.<sup>17</sup>

In a prospective study over a 4.5-year period, over 2% of 24,000 pregnant women were admitted for acute pyelonephritis.<sup>18</sup> Chills, fever, and back pain were the

most common complaint in 656 women, while lower urinary tract symptoms, nausea, and vomiting were very common. Documented fever was present in 96% and costovertebral angle tenderness was positive in 97% (27% were bilateral).<sup>18</sup> In most (67%) of these women, pyelonephritis occurred during the last two trimesters; but 8% were diagnosed intra-partum and 19% occurred post-partum. Of 501 women with antepartum pyelonephritis, the pregnancy outcome was spontaneous abortion in 5, stillbirth in 4, neonatal death in 2 (for a prenatal mortality of 12 per 100), and 133 (23%) developed recurrent acute renal infection.<sup>18</sup>

A more recent longitudinal study over 2 years from the same center (Parkland Hospital, Dallas) reported on 440 cases of acute antepartum pyelonephritis (1.4% incidence).<sup>12</sup> Acute pyelonephritis occurred most often in the second trimester (53%) with *E. coli* accounting for 70% and group B *Streptococcus* in 10%. Complications included anemia (23%), septicemia (17%), transient renal dysfunction (2%), pulmonary insufficiency (7%), and 43 (10%) required admission to the intensive care unit (indicating severe sepsis syndrome).<sup>12</sup>

In a retrospective review of 18 patients with septic shock during pregnancy, the causes were acute pyelonephritis (33%), chorioamnionitis (16%), post-partum endometritis (11%), toxic shock syndrome (11%), and miscellaneous conditions (27%).<sup>15</sup> The incidence of septic shock was 1 per 8,338 deliveries, with a mortality of 28% (N = 5), and of nine women delivering while septic, only two babies survived with significant morbidity. However, three patients delivered 15–20 weeks after the episode of septic shock had uncomplicated deliveries. Of the 14 pregnancies that reached viability ( $\geq 24$  weeks gestation), perinatal mortality was high (29%).<sup>15</sup>

### 4.1.3 Comments

Obstetric patients with acute pyelonephritis require hospitalization for intravenous fluids (saline), initial parenteral antibiotics, and close monitoring. Although most women will do well, the perinatal morbidity and mortality is significant. The majority of patients will respond within 48 h of treatment, and failure to do so requires ultrasonography to exclude obstruction and renal calculi. Transient renal impairment is commonly seen (about 20%) and usually improves with rehydration. The exact incidence of septic shock in pyelonephritis of pregnancy is unclear, but it appears to be very low.

Empiric therapy for acute pyelonephritis in pregnancy usually consists of intravenous ampicillin (for *streptococcus* and enterococci coverage) and gentamicin (for coliform coverage) until identification and susceptibility of the recovered microorganism is available.<sup>5</sup> The dose of gentamicin recommended has been 3–5 mg/kg/day, previously as three divided doses, but since the 1990s is commonly given as a single daily dose. Gentamicin levels (pre- and post-therapy) used to be recommended to assess toxic concentrations when multiple daily doses were in vogue. In pregnancy, there was an increase in vascular volume and the volume of distribution with enhanced glomerular filtration rate, resulting in a high prevalence

of sub-therapeutic levels. With the advent of single dose of aminoglycosides, sub-therapeutic levels are no longer a problem as 3–5 mg/kg is given once daily. In this instance, the trough level only is assessed, and should be 0 to  $<2 \mu\text{g/mL}$ . In animal models, single daily doses of aminoglycosides are associated with less toxicity and may be more effective, but clinical studies have been less convincing (probably from small sample sizes).<sup>19</sup> Sub-therapeutic trough levels of aminoglycosides given for a few hours once a high peak level is achieved is probably not therapeutically important, as the aminoglycosides have a prolonged post-antibiotic effect on coliforms (inhibition of the bacteria even after the antibiotic is removed) and the rate of killing is concentration dependent. It should be noted that in patients with renal impairment, the initial dose would be same as for normal renal function, but the subsequent dose or dosing interval would be adjusted according to the trough level and estimated gentamicin clearance.

Thus, in the present case under discussion, there is valid argument by the plaintiffs' attorney that the first physician should have arranged for an air-ambulance transfer to the acute care hospital the night before, and that close monitoring and aggressive treatment for severe sepsis would have prevented the adverse outcome. Furthermore, the initial dose of gentamicin should have been at least 3 mg/kg ( $\approx 200 \text{ mg}$ ), and that failure to give the appropriate dose resulted in progression of the sepsis syndrome.

The charge of negligence against the second physician for the delay in assessing the patient until 2 h after his arrival is considered a break down in the health care system and the manner of patient handover. It is the duty of an incoming physician just starting his or her shift to assess the most seriously ill patient first, either in an emergency department, freestanding medical center, or hospital. However, whether a 2 h delay in appropriate aggressive treatment for sepsis would have made a difference in the outcome would be difficult to ascertain. This would largely depend on the duration of severe hypotension and poor peripheral tissue perfusion, and the response to aggressive fluid resuscitation at the remote medical facility.

The next issue brought forth by the plaintiff's lawyer was the fetal loss and liability of the physicians. It was stated that had the initial physician arranged transfer from the night before, progression to septic shock would have been prevented and the fetus or baby would likely have survived. Based on current data, it does appear that the prevalence of fetal loss is significantly less in pregnant women with uncomplicated pyelonephritis than in those with septic shock.

## 4.2 Case 2: Fever Post-cesarean Section

*A 29-year-old woman presented to the emergency department of an urban hospital in early active labor at 8 a.m. one morning. She was 38 weeks pregnant and this was her first pregnancy. The patient noted premature rupture of her membranes (PROM) from the late evening before (14 h). Her past medical history was insignificant and the prenatal vaginal culture for group B Streptococcus was negative.*

*On admission, her vital signs (including temperature) were normal and the leaking amniotic fluid was clear. Since her cervix was inadequately dilated, an oxytocin drip was started for induction of labor, an internal fetal electrode was inserted, and the condition of her cervix was assessed by repeated vaginal examinations (4). After 12 h, the cervix was still not fully dilated to facilitate delivery, and an emergency lower segment cesarean (C) section was performed, about 24 h after onset of PROM. A healthy baby was delivered (7 lb) with no operative complication, and the patient was discharged home 2 days later.*

*Three days after discharge from hospital, the patient was readmitted through the emergency department, with symptoms of fever, sweats, and a painful incision wound since the day before. The emergency physician assessment at 6 a.m. noted a temperature of 36.7°C, pulse of 120/min, blood pressure of 120/70 and normal respiratory rate and oxygen saturation. She was noted to be ill looking, and in severe pain with nausea and vomiting, plus there was mild erythema, and marked tenderness of the incisional wound and surrounding areas of the lower abdomen. A diagnosis of wound infection was made, blood cultures were obtained, and intravenous antibiotic (cefazolin) was started.*

*She was assessed that morning by the obstetrical service and found to be hypotensive with a blood pressure of 70/60 mmHg, but she responded to intravenous saline. Her temperature then was 38.6°C, and the wound appeared erythematous on the right side of the incision but there was marked tenderness, and firm induration around the entire surrounding areas of the wound. An Infectious Disease consultation was obtained 24 h later as her temperature was still 39°C, and the area of redness and tenderness had spread to involve the right lower abdomen and upper thigh. The patient was noted to be tachypneic (respiratory rate 40/min), blood pressure 100/70 and the pulse 110/min. The previous complete blood count was 17,800 cells/uL, with a left shift and normal creatine. The antibiotics were then changed to intravenous clindamycin and gentamicin and a computerized tomography of the lower abdomen was performed, which showed gas in the soft tissue, with edema of the lower abdominal wall and right upper thigh. She underwent radical surgery for extensive debridement of the lower abdomen, right upper thigh, and flank, extending to the back 58 h after admission. Debrided tissues revealed necrotizing fasciitis and cultures grew mixed organisms consisting of coliforms and anaerobes. The patient eventually recovered, but required skin grafts and was left with scars and disfigurement of her lower abdomen, flank, and right thigh. She spent over a month in hospital.*

### **4.2.1 Medico-legal Issues**

The plaintiffs (patient and husband) filed litigation suits against the obstetrician, consultants, and the hospital. Compensation was sought for damages resulting in prolonged hospitalization, disfigurement, and mental anguish. The claims were negligence of the obstetrician, his assistant, and the anesthesiologist in not giving

appropriately required prophylactic antibiotics to prevent this severe adverse outcome. In addition, the plaintiffs' lawyer claims that if appropriate antibiotic prophylaxis were given before the cesarean section, the patient would not have suffered from the post-operative infection.

Further claims of negligence on the part of the attending team (obstetric/gynecology service) and the consultants, were the delay in making the proper diagnosis of necrotizing fasciitis. This caused delay in surgery, which led to progression of the infection, resulting in extensive tissue damage. It was further stated, that if the correct diagnosis and proper treatment were implemented within 24 h, the degree of tissue damage, subsequent pain, suffering and disfigurement would have been much less.

The defendants lawyers' countered that the physicians and hospital treated the patient appropriately and timely, and that rare infections and complications can occur in cesarean sections, due to no fault of the healthcare professionals. Furthermore, the defendants should not be held accountable as their management during the two admissions met the standard of care.

### 4.2.2 Medical Issues

Prior to labor and rupture of the membranes (ROM), the amniotic cavity is usually sterile. The cervical mucus and intact placental membranes provide a physical, chemical, and microbiological barrier for bacterial entry. Once ROM occurs with labor, there is a potential for microorganisms colonizing in the lower genital tract to ascend and infect the amniotic cavity. The quantity of bacteria recovered from the amniotic cavity in some patients increases with duration of ROM before delivery. Thus, patients with prolonged rupture of the membranes (PROM) before delivery (defined as  $\geq 12$  h by some specialist and  $\geq 18$  h by others), would increase the risk of peripartum infections. The onset of labor with uterine contractions may facilitate the ascension of bacteria into the uterine cavity by a massaging effect.

Bacteria can gain access to intrauterine tissues in pregnancy by three mechanisms: (1) transplacental transfer of maternal systemic infection (rare, more common with viral infection), (2) retrograde flow of infection from the peritoneal cavity via the fallopian tubes (rare, possible with low grade pelvic infection) and (3) ascending infection from the vagina via the cervix—considered the most common.<sup>20</sup>

More recently it has been postulated (with some supporting evidence), that preterm labor (before 37 weeks gestation) is commonly precipitated by subclinical infection in the amniotic cavity with intact membranes.<sup>20-22</sup> It is believed that 40% of preterm labors are induced by intrauterine infection (without clinical manifestations of infection). Colonization of the vagina by certain microorganisms (*Gardnerella vaginalis*, *fusobacterium*, *Mycoplasma hominis*, *Ureaplasma urealyticum* etc.) may ascend from the vagina and colonize the decidua and possibly the fetal membranes, and may then enter the amniotic sack. However, the case under discussion, by definition, did not have preterm labor or delivery.

The patient's (case 2) pregnancy, however, was complicated by puerperal infection or sepsis. Puerperal fever is defined as  $\geq 38^{\circ}\text{C}$  on any two of the first 10 days post-partum, exclusive of the first 24 h.<sup>21</sup> The most common causes of puerperal fever are genital infections, urinary tract infection, wound infection, and less commonly pneumonia, atelectasis, deep vein thrombosis, and breast engorgement (the latter lasts under 24 h and usually  $< 39^{\circ}\text{C}$ ). Although the genital infection of the uterus used to be subdivided as endometritis (inflammation of the endometrium), endomyometritis (inflammation of the myometrium), and endoparametritis (inflammation of soft tissues surrounding the uterus), varying degrees of all three layers of tissue are usually involved. Thus, recently the term "metritis" with pelvic cellulitis is more in vogue.

The most important predisposing factor for puerperal genital infection is the route of delivery. In vaginal delivery the average rate of metritis is 1.3%, with a higher rate of 6% for high-risk cases (prolonged rupture of membranes and labor, multiple cervical examinations, internal fetal monitoring), and up to 13% for presence of intrapartum chorioamnionitis.<sup>21</sup> All women undergoing C-section are considered high risk and routine antibiotic prophylaxis is now recommended. Before adoption of routine prophylaxis for C-section, the incidence of uterine infection was dependent on social economic status; 13% in affluent (especially white) women and from 27% to 50% in indigent women.<sup>21</sup> In women with high-risk delivery (prolonged rupture of membranes/labor, multiple vaginal/cervical examinations, internal fetal monitoring, cephalopelvic disproportion), serious pelvic infections after C-section (without antibiotic prophylaxis) occurred in up to 90%.<sup>21</sup>

Other risk factors for puerperal infection after C-section include race (African-American), bacterial colonization of the vagina with certain organisms (group B and A *Streptococcus*, bacterial vaginosis, *Chlamydia trachomatis*, *Gardinerella vaginalis*, and *Mycoplasma hominis*), young age and nulliparity, obesity and multi-fetal gestation.<sup>21</sup>

Wound infection post-C-section typically occurs 4–7 days postoperatively, but certain infections with virulent bacteria (group A *Streptococcus* and clostridial species) can appear within 2 days of surgery. The pathogenesis of wound infections are mainly of two sources, inoculation of the wound from the skin (*Staphylococcus aureus*), or endogenous inoculation from ascension from the vagina (mixed infection, group B *Streptococcus*, etc). Group A *Streptococcus* can be either externally from skin colonization via oropharynx, or from vaginal or rectal (rare) colonization. Rarely can the microorganisms be introduced from external sources at surgery, such as the environment of the operating room or the surgical team.

Cesarean delivery provides direct access to the wound from microorganisms that ascend to the uterine cavity, and most of the post C-section wound infections are believed to be of cervico-vaginal origin. Hence, post C-section wound infections commonly consists of mixed organisms (as in case 2), such as *Enterobacteriaceae* species, *Streptococcus* species, and anaerobes, and rarely genital mycoplasmas. *S. aureus* infections, which account for about 25% of the wound infections, usually arise from the patient's skin in chronic nasal colonizers. It should be noted that wound infection post-C-section is frequently complicated by endometritis or



parametritis, and all serious wound infections with fever should be investigated for this complication with ultrasonography or CT scan.

The management of post-C-section wound infection includes opening of the wound down to the fascia, drainage of pus, and debridement of any necrotic or devitalized tissue.<sup>23</sup> Parental antibiotics are usually started to cover expected microorganisms until culture and susceptibility are available. Complete integrity of the fascial suture line should be assessed, and a more serious necrotizing fasciitis can be excluded by early surgical intervention. Usually the wound is liberally irrigated by sterile saline and packed daily with sterile packing gauze, or more often as needed.<sup>23</sup>

Necrotizing fasciitis is a rare rapidly progressive infectious complication of C-section, characterized by extensive necrosis of subcutaneous tissue and other adjacent surrounding soft tissue. Most cases of necrotizing fasciitis are secondary to mixed synergistic infection with coliforms, streptococci, and anaerobes (including bacteroides species and clostridia species). Occasionally, group A *Streptococcus* can be the cause of puerperal necrotizing fasciitis and be introduced externally from the skin or throat, or endogenously from the vagina or anal carriage. Post-C-section necrotizing fasciitis is associated with diabetes mellitus, obesity malnutrition, intravenous drug abuse, and hypertension.<sup>23</sup>

A retrospective review of 23 women admitted to an obstetric and gynecology service with necrotizing fasciitis in a single hospital over 14 years was recently reported.<sup>24</sup> Six women (26%) were puerperal complications, three of whom were associated with C-section and three from episiotomy infections. As noted in this report and other series, necrotizing fasciitis, whether in the abdomen or vulvar area, are usually polymicrobial.<sup>24–27</sup> Obesity was a major predisposition, occurring in 86.9% of the entire cohort of 23 women. Severe pain on presentation was a common manifestation in 83.3% of puerperal complications and 70.6% of the non-puerperal patients. Common findings on physical examination include marked degree of subcutaneous edema with varying degrees of skin discoloration, rare presence of overlying anesthesia (one patient), and presence of subcutaneous gas by radiography in eight (34.8%) patients.<sup>24</sup> The recognition and early diagnosis of necrotizing fasciitis post-C-section or delivery is critical because delay in a few hours in intervention can be fatal.<sup>23</sup> A characteristic feature of most cases that leads to delay in diagnosis is the benign-appearing wound and skin, but patients were systemically toxic or ill looking, often with persistent fever, marked leucocytosis and spreading inflammation of the surrounding tissues. Although radiographic studies,<sup>28,29</sup> ultrasonography, CT scan,<sup>30</sup> or magnetic resonance imaging (MRI)<sup>31</sup> have been used to assist in differentiating cellulitis or ordinary wound infection from necrotizing fasciitis, or bedside biopsy for frozen section,<sup>32</sup> there has been no prospective evaluation to assess differential merits and effect on outcome. In a small case control study of 21 necrotizing fasciitis and paired match controls, multivariate analysis found that a white blood count  $>14 \times 10^9/L$ , serum sodium  $<135$  mmol/L, and blood urea nitrogen  $>15$  mg/dL separated those with necrotizing fasciitis from those with non-necrotizing infection.<sup>28</sup> This study needs to be repeated in prospective larger trials and include other investigations,

such as creatine phosphokinase, venous lactate, and easily obtainable portable imaging (ultrasonography).

Necrotizing fasciitis of any cause carries a high morbidity and significant mortality. The fundamental principles of therapy include prompt administration of broad-spectrum antibiotics, and early immediate surgery with radical debridement of necrotic and devitalized tissue, until normal bleeding tissue is visible.<sup>23</sup> Nutritional support and correction of fluid and electrolyte balance, anemia, and renal impairment are of major importance. The need for immediate aggressive surgery for necrotizing fasciitis has been recognized since the 1950s<sup>33</sup> and reinforced by more recent guidelines.<sup>34</sup> Initial observation showed that the average time from onset of disease to diagnosis and treatment was 4 days for those who lived, and 7 days for those who died.<sup>35</sup> Other subsequent studies found 48 h duration was a more significant time frame, after which the mortality rate was 75%.<sup>27</sup> The critical time for radical surgery after admission to hospital for manifestations of necrotizing fasciitis appears to be less than 12 h, as significant morbidity exists if surgery is delayed for >12 h.<sup>36</sup>

### ***4.2.3 Comments on Medico-legal Issues***

There is increasing evidence that C-section carries a greater risk to the mother and baby than vaginal delivery. However, in the case presented, C-section was necessary and clinically indicated. The plaintiffs' main accusation of negligence was failure of the obstetrical service and/or anesthesiologist to provide prophylactic antibiotic before or during the C-section.

Current guidelines recommend antibiotic prophylaxis and 1–2 g of intravenous cefazolin after cord clamping, to prevent infection for elective or non-elective (emergency) C-sections.<sup>37</sup> Previous guidelines by the American College of Obstetricians and Gynecologists (ACOG) had recommended in 2003<sup>38</sup> that all high-risk patients undergoing cesarean delivery be given antibiotic prophylaxis (level A evidence). Although the evidence was inconclusive for low-risk patients undergoing C-section, use of antibiotic prophylaxis was also recommended (level C evidence). In a Cochrane review of the topic,<sup>39</sup> 81 studies were analyzed for elective C-section (N = 2,037) and non-elective C-section (N = 2,132). There was a finding of reduction of endometritis by two-thirds to three quarters, and a significant reduction of wound infections (36% for non-elective and 73% for elective C-section).<sup>39</sup> The policy of routine antibiotic prophylaxis for all C-section was also supported by other reviews.<sup>40,41</sup> Thus, a single dose of safe, inexpensive antibiotic is very effective in preventing endometritis and surgical wound infection after C-section. It is most likely that in case 2, the infection ascended from the vagina to the uterine cavity (with endometritis), then spreading to the wound and surrounding tissue causing necrotizing fasciitis. Thus, if prophylactic antibiotics were given, it is more likely than not that the serious puerperal infection would have been prevented. It should be noted that the patient under discussion fulfilled the criteria for high-risk

C-section, which is associated with post-operative infectious complications of 70–90% without antibiotic prophylaxis.

Another area of grievance expressed by the plaintiffs against the defendants was the delay in arriving at the correct diagnosis and implementing appropriate surgery. This delay resulted in spread of the infection causing extensive tissue damage and disfigurement. The patient had increased risk factor for ascending infection from the vagina (prolonged rupture of membranes and labor, multiple vaginal examinations, internal fetal monitoring etc.) and she also presented with the typical manifestation of wound necrotizing fasciitis (severe pain and tenderness, high fever and leucocytosis, with little skin erythema, and marked wound swelling and induration). Thus, the index of suspicion should have been high for this complication.

The defense put forward by the defendants lawyers argue that necrotizing fasciitis is a very rare condition and that none of the physicians attending the patient had personal experience managing such a case post-C-section. If we examine the management course of the patient after the second admission, it is evident that the nature of the infection could have been detected earlier just by following standard guidelines for an infected wound<sup>23</sup> – i.e. surgical opening of the wound for debridement and drainage soon after admission would have led to the proper diagnosis. It is not clear why this simple intervention was not performed soon after admission by the obstetrics and gynecology service.

Did the initial choice of antibiotics play a role in progression of the infection? Although gentamicin and clindamycin (started 24 h after admission) are considered the gold standard for endometritis and synergistic fasciitis,<sup>41</sup> other broad-spectrum monotherapy (piperacillin-tazobactam, ampicillin-sulbactam, ertapenem etc.) would be equally effective. Although cefazolin was initially started on admission, which is a reasonable choice for monomicrobial wound infection, it is doubtful whether earlier broad-spectrum therapy would have changed the course without adequate surgery.

### 4.3 Case 3: Laparoscopy for Pelvic Adhesions

*The family physician (FP) of a 33-year-old female requested a gynecological consultation for the patient's symptoms of chronic lower abdominal pain and painful intercourse. The patient had a previous cesarean section a few years before, and a more recent laparoscopic tubal ligation. Based on the previous laparoscopic findings, the gynecologist attributed the young woman's symptoms to multiple adhesions involving the bladder, intestines, uterus, and lower abdominal wall. Thus, he recommended lysis of the adhesions by laparoscopy to be performed in the small town community hospital. The patient had no significant past medical illness and a pre-operative clinical assessment by the FP a week before the planned procedure was normal.*

*Three days before the surgery, the young woman called the FP's office complaining of sore throat, difficulty swallowing, and mild cough from trying to clear throat*

*secretions. Apparently, the physician's secretary informed the FP who advised that an office visit was not necessary and no medications were needed before the surgery, but that throat lozenges could be used for symptomatic relief. On the day of surgery, the routine examination performed by the anesthesiologist was reported to be normal. The surgical procedure was uncomplicated and no preoperative antibiotic was administered.*

*Two days postoperatively, the patient presented to the hospital emergency department with symptoms of severe abdominal pain, vomiting, and fever. She was found to be hypotensive with tachycardia and febrile (38.7°C) with signs of acute peritonitis. Cultures of the peritoneal fluid grew *Streptococcus pyogenes*, but the blood cultures were negative. Intravenous fluids and broad-spectrum antibiotics were initiated and an emergency laparotomy was performed. Generalized peritonitis with serosanguinous fluid was found, but no evidence of perforated intestines or uterus. She was postoperatively transferred for further management at the ICU of a tertiary care university teaching hospital. Her course was complicated by respiratory failure (due to ARDS), renal failure, liver disturbance, and heart failure, secondary to toxic cardiomyopathy. The patient survived the ordeal, but she required mechanical ventilation for 3 weeks, prolonged hospitalization, and convalescence. Six months later, she was doing fairly well with no residual kidney or heart failure, but she still had problems with dyspareunia and poor sex drive.*

### **4.3.1 Medico-legal Issues**

The patient and her husband subsequently instigated medico-legal actions for medical negligence against the FP, gynecologist, and anesthesiologist. Charges against the FP included failure to advise or clinically assess the plaintiff for her sore throat before the surgery, as this directly affected her complications of streptococcal group A peritonitis. Furthermore, the FP should have notified the gynecologist and anesthesiologist, or advised the patient to inform them of her symptoms.

The gynecologist and anesthesiologist were blamed for not taking a clinical history for any intercurrent illness before the surgery and preoperative assessment. Their failure to obtain a history of sore throat represented substandard care, and failure to postpone the elective procedure until resolution of her upper respiratory tract infection was medical negligence that caused a near catastrophic outcome.

Defense counsel for the physicians argued that there was no proof that the patient's sore throat was related to the infectious complication. Moreover, medical expert witness for the defense indicated that most cases of sore throat are due to viruses, and that the anesthesiologist found no evidence of pharyngitis or tonsillitis to suggest a streptococcal infection. In addition, the defense experts argued that the group A *Streptococcus* more likely originated from the colonization of her skin or vagina. Furthermore, it was contended that there are no guidelines for surgeons or anesthesiologists to cancel surgery for patients with mild upper respiratory tract infections.

### 4.3.2 Medical Aspect

One of the critical issues in this case is the source or origin of the group A *Streptococcus*. Although a throat culture was never done to prove or establish the origin, this is not necessary in civil lawsuits, and if the plaintiff's lawyer can show greater probability than other sources, then this may be accepted by the courts.

Humans are natural hosts of *S. pyogenes* and infection or colonization of other animals is rare and is typically a result of close contact with infected humans. The nasopharynx is the commonest site of carriage, and aerosolized nasopharyngeal secretions are the primary means by which group A streptococci (GAS) are spread among humans.<sup>42</sup> The carriage rates of GAS vary with geographic location, season of the year, and age. In children, the rates of pharyngeal colonization vary from 10% to 20%, being most common in Winter and Spring.<sup>43</sup> In adults the carriage rates are much lower. Skin carriage is usually infrequent except for patients who have skin diseases, such as eczema, psoriasis, and wounds or pyoderma.<sup>44</sup> Thus, direct contact with contaminated skin or mucus membranes is of secondary importance, and contact with contaminated surfaces or fomites or via insects are potential sources, but of minor importance.<sup>42</sup> Food-borne outbreaks of GAS pharyngitis from salads, eggs and cheese prepared by infected or colonized food handlers have been reported.<sup>44</sup> Occasionally mini-outbreaks of GAS wound infections in hospitalized patients have been associated with vaginal or ano-rectal colonization in health care personnel.<sup>43,45,46</sup>

Pharyngitis, or sore throat, is a common condition in adults and even more frequent in children. It was estimated that 18 million patients sought care for sore throats in the United States in 1996, making it the sixth leading cause of visits to physicians.<sup>47</sup> Moreover, four to six times more individuals may have, but not seek care for their sore throats. The majority of acute pharyngitis (about two-thirds) are caused by common respiratory viruses (rhinovirus, coronavirus, adenovirus, etc.), and only about 5–10% in adults and 15–30% in children are caused by GAS.<sup>44,48,49</sup> Other bacteria causing pharyngitis include group G and C  $\beta$ -hemolytic streptococci, diphtheria, *Arcanobacteria hemolyticum*, *Neisseria gonorrhoea*, *Mycoplasma pneumoniae*, and *Chlamydia pneumoniae*.<sup>44</sup> However, GAS is the most important bacterial cause of sore throat and probably *Fusobacterium necrophorum* (which probably can cause Lemierre syndrome) in adolescents and young adults.<sup>50</sup>

The spectrum of disease of GAS pharyngitis varies from mild sore throat with resolution of symptoms in 3–5 days, to severe tonsillitis with fever and lymphadenitis. Complications such as peritonsillar abscess, scarlet fever, bacteremia with toxic shock syndrome, glomerulonephritis, and rheumatic fever are uncommon complications, and rheumatic fever is now a rare complication in developed countries. The clinical diagnosis of GAS pharyngitis is considered inaccurate without a throat culture; the ability to predict presence of GAS by physicians is limited, with estimated sensitivity of 55–74% and specificity of 58–76%.<sup>44</sup> The Centor criteria proposed to improve the clinical diagnosis of GAS pharyngitis (moderate to severe cases attending an ER) include tonsillar exudates, tender

anterior cervical lymphadenopathy, absence of cough, and history of fever.<sup>51</sup> However, if three or four Centor criteria are met, the positive predictive value is still only 40–60%, and in the absence of these criteria, the negative predictive value is only 80%.<sup>44</sup> Because of the low predictive values of clinical criteria, expert panels recommend throat culture and treatment only of confirmed cases of GAS pharyngitis.<sup>52–56</sup> For patients with typical viral syndromes such as rhinorrhea, cough, myalgias, and sore throat (with or without fever), a throat swab is usually not necessary. Cost-effective analysis of the diagnosis and management of pharyngitis in adults have found that throat culture is the least expensive and most effective strategy when the prevalence of GAS pharyngitis is less than 20%.<sup>57</sup>

### **4.3.3 Medico-legal Discussion**

Based on our current knowledge, it was most likely that the source of the GAS in Case three was from the throat (pharyngitis), as the patient had no skin lesions. Although vaginal colonization may result in endogenous disease with GAS, it usually occurs after delivery, intrauterine device insertion, or gynecologic procedure. Furthermore, there was no cluster of cases of postoperative or post-delivery infection in the institution to suggest a health care carrier as a source of the infection.

What was the duty of the FP when he was notified that the patient complained of sore throat just before surgery? An expert witness for the plaintiff in a similar medical practice criticized the care of the FP as being substandard and negligent. He opined that the physician should have arranged to clinically assess the patient or notified the gynecologist of the patient's symptoms of pharyngitis.

Was either the gynecologist or anesthesiologist at fault? Both these physicians denied knowledge of the patient's sore throat before surgery and did not report any abnormal clinical findings. Hence, it is unlikely that they could be held responsible or be considered medically negligent by the court. The anesthesiologist testified that if he were aware that the patient had pharyngitis, he would have postponed the surgery. However, there are no well-documented guidelines for surgeons or anesthesiologists on this issue.

It had been widely believed that general anesthesia should be avoided in patients with upper respiratory tract infections (URTI), although clinical studies found mixed results. An editorial comment in 1991 stated that the current evidence supported the clinical impression of higher risk for pulmonary complications during anesthesia in subjects with respiratory tract infections.<sup>58</sup> The issue was again raised in 2001 after a study in children concluded that recent and active URTI (within 4 weeks) were at increased risk for adverse respiratory events, but most of the children underwent elective procedures safely without increased morbidity.<sup>59</sup> A later study by the same group of investigators in 713 children undergoing cardiac surgery, found the presence of URTI was predictive of postoperative infection and multiple complications.<sup>60</sup> However, there is no similar data in adults and specifically no recent data of the risk of GAS pharyngitis peri-operatively. Guidelines for

prevention of surgical site infection noted increased risk of wound infection with any coexistent infections at a remote site,<sup>61</sup> but did not specifically address the issue of pharyngitis. In a previous study of 2,349 patients with clean surgical wounds, wound infection rate in 208 patients with documented remote infections was 14.8% compared with 6.9% in the 2,141 patients without remote infections ( $p > 0.001$ ).<sup>62</sup> However, in this study pharyngitis was not listed as one of the remote infections.

Thus, anesthesiologists and surgeons may face a dilemma with patients presenting with URTI before surgery, because of the fear of complications and litigation. As stated by editorial views, this decision is left to the physician's best clinical judgment about an individual patient undergoing a specific procedure for a specific duration of time.<sup>63</sup> It is evident the surgical team should weigh the risks versus the benefits of proceeding with surgery. Obviously, this would apply mainly to elective procedures rather than urgent or semi-urgent conditions.

Good judgment, common sense, and proper informed consent with adequate discussion involving the patient and family should take precedence in making the decision to proceed with a specific case. In most cases of elective surgery, the final decision to proceed should be left to the patient (or guardian) once the risks have been explained and well documented.

The emotional and economic impact of delaying elective surgical procedures should be considered in the decision making. Overall, the risk of surgical site infection increases by twofold (in clean surgery) in those with remote infection, compared to controls without infection. Pre-operative treatment of remote infection can reduce the risk of subsequent wound infection by 8.5% in treated versus 25% in those not treated.<sup>62</sup> Peri-operative antibiotics for surgical prophylaxis were not helpful in reducing the risk of wound infection for those with remote site infection. Based on limited experience, the authors conclude that remote site infection should be treated for at least 24 h before surgery.<sup>62</sup>

It may be prudent to automatically delay elective procedures for some conditions in patients with remote site infections. These may include surgical procedures with insertion of prosthesis, as the risk of infection can be catastrophic; or in non-essential cosmetic surgery or minor ailments, or where the benefits of the procedure do not warrant even a small increased risk of infection.

## 4.4 Summary and Final Comments

Complications of pregnancy and delivery are common medical litigation issues, both for infectious and non-infectious adverse events and outcome. Physicians who perform deliveries (obstetricians or family physicians) have one of the highest medical protective fees in Canada. Physicians have to be extra careful when dealing with the pregnant patient. Even though the majority of pregnancies have no significant medical complications during gestation or after delivery, numerous medical adverse events potentiality can occur.

There are several reasons why medical malpractice litigations rulings often go against the healthcare professionals in favor of the plaintiffs and frequently result in large financial compensations. Members of the jury and judges will often be sympathetic to pregnant women who suffer from an adverse event (human nature) and there may be a tendency to rule in their favor. Moreover, the effects of these adverse outcomes may affect not only the mother but also the offspring. The way to limit being sued for medical malpractice when managing or attending pregnant women involves the same principles of good medical practice that should always be followed. Pay attention to detail, (history, examination, and test results), keep an open mind, always look for the worst complication, but do not overlook simple “minor issues” which may become major issues, and always attend and treat promptly. Whenever there is a potential for a catastrophic outcome, (despite the rarity of that event) have a high index of suspicion and do not hesitate to refer or transfer patients quickly to an acute care hospital or tertiary care center, or request a consultation with a specialist. Too often however, basic principles of treatment are neglected until it is too late – such as not opening and exploring a local infected wound. To a certain extent, we as physicians are too over dependent on modern technology (CT, MRI) and specialist opinion before implementing the basic tenets of proven therapy, which have been established for more than a century.

Whether we are practicing medicine in a large urban center or remote medical-outpost, many simple routine screenings can be performed to limit various infectious complications of pregnancy. Tests such as routine midstream urine (MSU) culture in the second trimester (can repeat in third trimester in those with a history of urinary tract infection), routine vaginal culture in late third trimester for group B *Streptococcus* colonization, or assessment for vaginitis, endocervicitis and sexually transmitted disease (including syphilis and human immunodeficiency virus [HIV]) can be very informative.

High-risk patients (especially planned or emergency C-section) need to be dealt with cautiously and expectantly. Obstetricians and family physicians who perform deliveries, as well as anesthesiologists, should be familiar with and follow the guidelines for antibiotic prophylaxis to prevent metritis, wound infection, chorioamnionitis and neonatal sepsis. If for some reason indicated antimicrobial prophylaxis were overlooked, the patient should be informed of the oversight and of the possible complications and their early manifestations, and instructed to seek prompt medical attention at the first signs of such complications. The attending medical team and family physician should also be alerted to these potential complications, and maintain a high index of suspicion, whenever the patient presents with a febrile illness within 2 weeks of delivery.

Physicians should be aware that even a mild sore throat could pose a significant risk for patients about to undergo surgery. The risks of the possible complications versus the benefit of the procedure should be discussed with the patient. The final decision should always be made by the patient without coercion. Although most cases develop no significant complications, some can result in severe or catastrophic outcome, which cannot be predicted.



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