

REVIEW ARTICLE

Trends in Surgical Management of Uterine Rupture

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Abstract

Introduction: Uterine rupture remains one of the top catastrophic events in the field of Obstetrics. Management options are often surgical and limited to either fertility sparing versus complete loss of reproductive function. In the developing world, uterine rupture can have devastating maternal and/or fetal outcomes due to delayed recognition and/or intervention. With medical advancements over the years as well as the significant increase in cesarean delivery rates worldwide, it is beneficial to determine how the management of uterine rupture has evolved worldwide.

Methods: A literature review was conducted in PubMed database over the last 30 years. Journal articles that described the surgical management of uterine rupture were selected and reviewed. The incidence of uterine rupture was noted, as well as the most common etiologies and management strategies.

Results: The incidence of uterine rupture ranged from 0.015 to 3.76% across various countries. The two most common etiologies of uterine rupture were obstructed or neglected labor and a scarred uterus. Prior to 2010, uterine rupture involved a scarred uterus in 6.2 to 46.7% of cases. Reviews from 2010 onward reported prior scarred uteri as a cause of uterine rupture 66-100% of the time. Hysterectomy was overall the most common surgical method employed in greater than 50% of the cases prior to 2010. From 2010 onward, 77-100% of uterine ruptures were managed with uterine repair with or without bilateral tubal ligation.

Conclusion: As cesarean delivery rates have increased worldwide, the etiology of uterine rupture has shifted from that of obstructed labor to that of the scarred uterus. As a result surgical management of uterine rupture has also shifted from primarily hysterectomy to mostly uterine repair, as the presentation of these ruptures are less catastrophic.

1. Introduction

Uterine rupture continues to be one of the most concerning obstetrical emergencies worldwide. If not identified and/or managed expeditiously, it can result in fatal outcomes to both the mother and the fetus. In the developing world, due to poor access to obstetrical care, lack of patient education, limited prenatal care and little or no access to transportation, women continue to die from this event. The incidence of uterine rupture is reported as 0.3% in patients with a prior low transverse cesarean delivery.¹

Once diagnosed, the treatment is often surgical and limited to either fertility sparing or sterilization. The described procedures involve total hysterectomy, subtotal hysterectomy, and uterine repair with or without tubal ligation. Each procedure comes with its own risks and benefits. Primary repair is uterine sparing, but leaves the patient vulnerable to an increased risk of re-rupture with a future pregnancy. Uterine repair with tubal ligation results in a loss of reproductive function, but provides patients with the option of fertility treatment if pregnancy is later desired. Hysterectomy results in a complete loss of reproductive function, requires a certain level of surgical expertise, and can have a significant impact on a patient's emotional and psychological state, as well as impact their current and future relationships.

Uterine rupture has been long described in the literature, but there is no standardized algorithm for the management of uterine rupture. Cesarean delivery rates are steadily increasing worldwide and with more women being recommended to have a trial of labor when possible,² appropriate management of uterine rupture remains at the forefront of the mind of

the obstetrician. The goal of this article is to review the etiologies and management of uterine rupture in various countries, as well as to describe specific trends over the years.

2. Methods

An online literature search was performed in PubMed database. All journal articles in English, which described the surgical management of uterine rupture were selected and reviewed. Uterine rupture was defined as the full thickness disruption of the uterine wall, including the serosa. Only reviews of cases meeting this criterion were included. Each article was reviewed to determine the reported incidence of uterine rupture in that institution, the causes of uterine rupture, as well as the preferred surgical management employed.

Articles which were not in English, or were not available online were excluded. Articles that did not report the surgical technique employed or the incidence of uterine rupture in patients with scarred uteri versus unscarred uteri were excluded as well. The selected articles were reviewed and used to provide a descriptive analysis of trends in presentation and surgical management of uterine rupture.

3. Results

Articles were all retrospective studies, with one prospective study. They involved academic hospitals, teaching hospitals or tertiary level centers. Many of these hospitals were referral centers or a catchment area for the surrounding large rural areas. Most articles prior to 1990 were not available in online archives and were not included. There were no reviews describing uterine rupture in the United States. All reviews

were of uterine ruptures in countries in Africa and Asia.

The overall incidence of rupture ranged from 0.015 to 3.76% (see Table 1). Most authors

reported a rate of rupture of less than 1% with only a few exceptions. Hospitals in Yemen, Pakistan and Ethiopia reported rates of 1.09%, 1.56% and 3.76% respectively.

| Time Period | City, Country | Overall Incidence (%) | UR in prior scarred uterus (%) | Patients with repair +/- TL (%) |
|-------------|-------------------------|---------------------------|--------------------------------|---------------------------------|
| 1970-1979 | Mumbia, India | 0.137 | 11.4 | 31.4 |
| 1977-1997 | Doha, Qatar | 0.019, 0.015 ^a | 43.5 | 34.7 |
| 1980-1989 | Mumbia, India | 0.116 | 23.4 | 37.5 |
| 1992-1999 | Ilorin, Nigeria | 0.476 | 23.0 | 64.0 |
| 1993-1998 | Bihar, India | 0.925 | 27.0 | 36.5 |
| 1998-2012 | Turkey | 0.116 | 31.1 | 34.4 |
| 1999-2004 | Hajjah, Yemen | 1.09 | 28.3 | 45.0 |
| 1999- 2004 | Dharan, Nepal | 0.892 | 19.8 | 45.5 |
| 2000-2009 | West Wollega, Ethiopia | 3.76 | 6.2 | 98.7 |
| 2003-2007 | Benin City, Nigeria | 0.420 | 30.4 | 63.6 |
| 2003-2009 | Dar es Salaam, Tanzania | 0.224 | 33.6 | 24.5 |
| 2006-2009 | Kassala, Sudan | 0.206 | 32.1 | 60.7 |
| 2007-2008 | Wa, Ghana | 0.806 | 17.1 | 23.3 |
| 2008 | Liaquat, Pakistan | 0.746 | 46.7 | 46.7 |
| 2008-2010 | Puducherry, India | 0.290 | 77.4 | 86.0 |
| 2009 | Bannu, Pakistan | 1.56 | 18.8 | 20.3 |
| 2012 | Liaquat, Pakistan | 0.676 | 70.5 | 77.0 |
| 2006-2013 | Poriya, Israel | 0.031 | 100 | 100 |
| 2016* | New Delhi, India | 0.061 | 66.0 | 83.0 |

* Year of publication used. This is a 7-year review but dates were not reported

a Incidence reported in two intervals, 1977-87 and 1988-97

UR = uterine rupture, TL = tubal ligation

The two most commonly reported etiologies of uterine rupture were obstructed or neglected labor and a scarred uterus. Other risk factors were high parity, no prenatal care, increased maternal age, and the use of herbal concoctions to assist with labor.³ Prior to 2010, uterine rupture involved a scarred uterus in 6.2 to 46.7% of cases. Reviews from 2010 onward reported scarred uterus as a cause of uterine rupture in 66-100% of the cases.

Management options were always surgical and included total hysterectomy, subtotal hysterectomy, uterine repair, or uterine repair with bilateral tubal ligation. Hysterectomy was overall the most common surgical method employed in greater than 50% of the cases prior to 2010 except for the hospitals in Benin City, Nigeria; Ilorin, Nigeria; Kassala, Sudan; and West Welloga, Ethiopia. From 2010 onward, 77-100% of uterine ruptures were managed

with uterine repair with or without bilateral tubal ligation.

The authors in Bihar, India noted worse maternal outcomes with uterine repair compared to subtotal hysterectomy.⁴ This included increased operating time of 57 minutes versus 35 minutes, increased maternal mortality of 46% versus 20%, increased morbidity (blood transfusions, infections etc.) of 50% versus 30%; and a longer time to discharge of 27 days versus 14.5 days in the uterine repair patients compared to the patients who underwent subtotal hysterectomy.

In West Wollega, Ethiopia, where there was a high rate of uterine rupture of 3.76% and most cases were managed by primary uterine repair, the mortality rate was 5%, which the authors compared to 11-19% reported by other Ethiopian hospitals.

4. Discussion

There are multiple journal articles and reviews describing the outcomes and management of uterine rupture, primarily in developing countries. There is limited data or guidance about managing uterine rupture in the United States. Due to the urgent nature of this event and the potential for disastrous outcomes, surgical intervention is often required. This review has demonstrated that the surgical management falls within two tiers, that of complete sterilization with hysterectomy and the uterine sparing option of surgical repair with or without tubal ligation. There are many authors that recommend hysterectomy (subtotal or total) as the first line option, especially if patients have reported that they have completed childbearing.^{5,6,7} Other authors recommended choosing the more conservative option of

uterine repair when possible and only opting for subtotal hysterectomy if surgical repair not possible due to the clinical situation⁸. Regardless of the surgical procedure performed, the decision should be made on a case-by-case basis. The clinical situation including the patient's stability, the location and extent of the defect, as well as the patient's parity, and future fertility desires should be considered.⁹

This review shows a shift from primarily performing hysterectomies whether total or subtotal, to uterine repair being more common from 2010 onward. This is likely due to the increase in rate of cesarean deliveries and the fact that most uterine ruptures in patient's undergoing a trial of labor involve the cesarean scar. These cases of rupture tend to be a "cleaner rent" with less damage to the uterus making it easier to re-approximate than other causes of rupture.

At a few hospitals uterine repair was clearly the primary procedure of choice, even prior to 2010. In Benin City, Nigeria the authors acknowledged that the women presenting were all of a low parity, hence there was a conscious desire to preserve the uterus. In West Wollega, Ethiopia, the obstetrical coverage in the hospital is limited, there is no blood bank and anesthesia is provided by nurse anesthetists via ketamine infusion, hence primary repair was preferred to hysterectomy as it was considered a more straightforward procedure for surgeons with limited experience. In Kassala, Sudan, there was no explanation given for the preference for uterine repair. They however reported a maternal mortality of 14.3% with 3.6% of them occurring on arrival to the hospital due to hemorrhage. Majority of their patients (98.2%) are unbooked or what would be considered walk-ins or referral in the United

States. Therefore most of their uterine rupture cases were presenting to the hospital after the occurrence of the event, the more severe cases likely died prior to, or on arrival. The remaining surviving women may have had less severe ruptures, allowing for quick primary repair. The authors in Ilorin, Nigeria opted for the safest and quickest procedure in treating uterine rupture and had a repair rate of 64%.

It is important to note that the authors in Bihar, India reported that uterine repair carried a significantly higher risk of mortality and morbidity. The authors explained that this might be due to leaving behind necrotic and unhealthy tissue that increased the risk for complications such as infections, abscess formation, hemorrhage, or disseminated intravascular coagulation (DIC). However this was a retrospective study and may more be a reflection of the skill of the surgeons and the quality of care provided in the hospital both intra-operatively and post-operatively and is likely to be specific to that hospital. There were no other studies comparing the outcomes of patients who underwent repair versus hysterectomy. However many of the articles were able to show effective management with uterine repair even with an unscarred uterus. The post-operative course and risk of complications are likely to be determined by the resources and medical expertise available at the individual hospitals. The authors in Poriya, Israel managed all their uterine ruptures that occur during trial of labor with primary repair, and performed no hysterectomies.

Historically in developing countries, obstructed or neglected labor, often outside of hospital has been cited as the main cause for uterine rupture. This data demonstrates that with the increasing rate of cesareans deliveries, that prior scarred

uterus is becoming the lead cause of uterine rupture worldwide in developing and developed countries. This data also supports that primary repair of the rupture is feasible and quick, and is likely to have better outcomes in resource rich countries where hemorrhage and infection can be managed expeditiously and efficiently.

There are limitations to this review. Majority of the articles are from hospitals in developing countries and the population they serve is not representative of that in the United States and hence it is not generalizable. All the articles except one were retrospective studies. Therefore decreasing the statistical strength of the studies. However one of the strengths is that there are multiple studies looking at the management of uterine rupture in countries where most patients are likely to die from such a catastrophic event, and they have consistently shown that surgical management involving primary repair is life saving and often effective treatment. This further supports that these techniques can be applied to resource rich countries, where the presentation of uterine rupture albeit an emergency is often not so dire as these patients are usual laboring in-house making detection of the event easier. More studies are needed in resource rich countries to further support this data.

This study also supports that the type of rupture from a scarred uterus is very different from that of the unscarred uterus. The unscarred uterus often involves vertical ruptures, lateral ruptures and/or posterior ruptures, all causing significant damage to the uterus, making it more difficult to repair. Uterine rupture from a prior uterine scar can often be easily managed by primary repair. However women with prior rupture, who undergo primary repair without a tubal ligation, require extensive counseling about

their increased risk of rupture with future pregnancies. They should be offered effective contraception or sterilization if future pregnancy is not desired, or they should be monitored closely and offered cesarean delivery with their next pregnancy.

5. Conclusion

There remains a paucity of data, especially in the developing world regarding the management of uterine rupture. With the recent goals of addressing the increasing maternal mortality rate in the United States, as well as the American College of Obstetrics and Gynecology's recommendation of encouraging

patients to undergo a trial of labor after a cesarean delivery, being able to effectively manage uterine rupture should become a priority to the practicing obstetrician. The data in this review from 2010 onward is highly suggestive that uterine rupture can easily and safely be managed by repair of the rupture together with a tubal ligation in patients who have completed childbearing. Therefore limiting the need for hysterectomy to cases where repair is not feasible. Though each patient should be treated on a case-by-case basis, it is reassuring to think that primary repair can be considered first line treatment and is safe.

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