# Post-tonsillectomy hemorrhage

## *Monopolar microdissection needle versus cold dissection*

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## ABSTRACT

**الأهداف:** مقارنة معدل وشدة النزيف والحاجة للتدخل الجراحي والإحتياج لنقل الدم في حالات نزيف ما بعد استئصال اللوزتين بعد استخدام التشريح البارد وأحادي القطب.

**الطريقة:** أُجريت هذه الدراسة الاستطلاعية العشوائية في متشفى أبها الخاص، أبها، المملكة العربية السعودية على المرضى الذين خضعوا لاستئصال اللوزتين خلال الفترة من يونيو 2006م إلى ديسمبر2010م. لقد تم توزيع المرضى عشوائياً، وجُمعت بيانات المرضى، وطريقة الجراحة، ومدة الجراحة، ونسبة حدوث النزف أثناء العملية، وكذلك وقت النزيف بعد العملية، ووسيلة معالجته، والاحتياج لنقل الدم.

**النتائج:** خضع 1419 مريضاً لاستئصال اللوزتين منهم 634 ذكراً، و785 أنثى بمتوسط عمر 14.8 عاماً، وقد استخدم التشريح البارد في 674 حالة، وأحادي القطب في 745 حالة. لقد كان متوسط مدة الجراحة في التشريح البارد 7 دقائق، وفي أحادي القطب 3.2 دقائق. وقد نزف 27 مريضاً (1.9%)، 21 منهم بعد التشريح البارد (3.1%)، و6 بعد طريقة أحادي القطب (0.8%) ($p$<0.001). لقد تم إعادة إدخال كافة المرضى للمستشفى حيث خضع 11 منهم (9 بعد التشريح البارد، و2 بعد استخدام أحادي القطب) إلى التدخل الجراحي لوقف النزيف، ولم يتلق أي منهم نقل دم.

**خاتمة:** لقد كان لانخفاض معدل وشدة النزيف بعد استئصال اللوزتين دلالة إحصائية واضحة في المرضى الذين خضعوا لاستئصال اللوزتين بواسطة أحادي القطب (باستخدام إبرة كولورادو) مقارنةً بالمرضى الذين تم استصال اللوزتين لديهم بواسطة التشريح البارد.

**Objectives:** To compare the rate, severity, need for intervention, and blood transfusion requirement in post-tonsillectomy bleeding following the use of either cold dissection or the monopolar microdissection needle method.

**Methods:** A prospective randomized study conducted at Abha Private Hospital, Abha, Kingdom of Saudi Arabia, on patients undergoing tonsillectomy between June 2006 and December 2010. Patients were allocated randomly by using cold dissection or monopolar microdissection techniques. Collected information included demographic data, method, duration of surgery, and estimated blood loss. Timing of bleeding and management were recorded.

**Results:** A total of 1419 patients underwent tonsillectomy, 634 male and 785 female with mean age of 14.8 years (range 2-48 years). Cold dissection was used in 674 patients and monopolar microdissection needle in 745 patients. Mean surgical time in the cold dissection group was 7 minutes (range 3.5-15 minutes), while in the monopolar microdissection group was 3.2 minutes (range 2.2-9.5 minutes). Twenty-seven patients developed post-tonsillectomy bleeding (rate of 1.9%); 21 (3.1%) from the cold dissection and 6 (0.8%) from the monopolar microdissection group, ($p$<0.001). All patients were hospitalized. Eleven patients; 9 from the cold dissection group and 2 following monopolar microdissection, underwent surgical intervention to stop bleeding. No patient received blood transfusion.

**Conclusion:** Patients underwent tonsillectomy using the monopolar microdissection (Colorado needle) had statistically significant less post-tonsillectomy bleeding rate and severity compared with those using the cold dissection method.


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Tonsillectomy, with or without adenoidectomy, is currently one of the most common worldwide surgical procedures, representing approximately 20-40% of all operations performed by otolaryngologists.[1,2] The literature in the last decade has focused on a variety of surgical approaches using various modalities to perform tonsillectomy, including cold dissection, and monopolar microdissection.[3] Although tonsillectomy has been shown to be a safe operation, it still has significant morbidity.[4] Post-tonsillectomy hemorrhage is the major complication of the procedure and could be a potentially life threatening occurrence. It is classified as primary (<24 hours postoperatively) or secondary (>24 hours, commonly 5-10 days after the operation). Primary hemorrhage is considered to be related to surgical technique, while secondary (delayed) hemorrhage is believed to be due to factors influencing oropharyngeal healing.[5,6] Secondary hemorrhage has a rate of 3-4% leading to readmission to hospital.[1] However, studies comparing the rate of hemorrhage of monopolar diathermy with that of cold technique found no significant difference between both techniques.[7-9] The aims of any tonsillectomy procedure are efficient and cost-effective excision, minimal blood loss, no or low incidence of complications, and rapid recovery. To this end, a number of tonsillectomy techniques have been advocated in continuous attempts to find the most single clinically advantageous method over the others.[10-14] This prospective randomized study was conducted to compare the rate and severity of post-tonsillectomy hemorrhage between cold dissection and monopolar microdissection needle tonsillectomy and to determine whether there was any difference between the 2 operative tonsillectomy techniques.

**Methods.** A prospective randomized study conducted at Abha Private Hospital, Abha, Kingdom of Saudi Arabia, on all patients undergoing tonsillectomy between June 2006 and December 2010. The hospital was accredited by the Central Board for Accreditation of Health Institutes catering for all medical and surgical specialties with the exception of open heart surgery. Approval of the Hospital Research and Ethics Committee and informed consent of patients/guardians were obtained. Patients were randomized to either the cold dissection or monopolar microdissection needle tonsillectomy group using block randomization. The precise method of block randomization was not blind to the operator, but involved balancing the number of patients recruited to both arms of the study after every 20 recruits. This level of block randomization ensured that if the study had been stopped early, there would have been almost exactly the same number of cold dissection or monopolar microdissection tonsillectomies. There was difference between the 2 groups because 68 patients/guardians refused cold dissection and preferred microdissection needle tonsillectomy. Due to the nature of work in private hospitals, one consultant surgeon, who is well familiar with both methods of tonsillectomy, carried out the tonsillectomies. Criteria for inclusion in the study were recurrent attack of tonsillitis and/or obstructive tonsillar hypertrophy >3+ associated with any of the following symptoms: failure to thrive, restless sleep, daytime somnolence, chronic mouth-breathing, excessive snoring, enuresis, hyperactivity, cor-pulmonale, dysphagia, or speech abnormalities.[15,16] Excluded from the study were patients with active infection, systemic disease causing coagulopathy or bleeding disorder, known hypertension, diabetes, liver disease, and patients with facial anomalies or chronic debilitating disease. The information collected included demographic data, method, and duration of surgery starting from incision till the end of procedure, estimated blood loss, which included blood in suction bottle and tube, and the soaked gauze swabs were calculated and whether blood transfusion was needed. The timing of postoperative bleeding and management were recorded. All procedures were carried out under general anesthesia. A Crowe-Davis retractor (or McIvor in case of edentulous patients) was used for oral retraction. In the cold dissection tonsillectomy removal of both tonsils was by using cold surgical instruments and hemostasis secured by the bipolar diathermy. In monopolar microdissection tonsillectomy removal of the tonsils was through subcapsular dissection using Colorado needle tip (Stryker-Leibinger, Freiburg, Germany)[17] No antibiotic was routinely given. Postoperative pain management included acetaminophen suppositories 20-40mg/kg loading dose for children up to 10 years old prior to wakening from anesthesia, to be continued orally for 24 hours, pethidine one mg/kg intramuscular for older children and adults. Patients were discharged on the same day with full verbal and written instructions regarding pain, bleeding management, oral feeding and were instructed to report any post-operative bleeding. Patients with active bright-red blood bleeding were admitted to hospital for management of the bleeding. Postoperatively, patients were followed up within one week.

The data analysis was carried out using the Statistical Package for Social Science Version 16 software package (SPSS, Inc., Chicago, IL, USA). Chi square and Fisher's Exact were used as tests of significance at the 5% level of significance. Relative risk and its concomitant 95% confidence intervals were used to study the risk of developing post-tonsillectomy hemorrhage among the study sample. A $p$-value of <0.001 is considered statistically significant.

**Results.** During the period of the study 1419 patients underwent tonsillectomy. There were 634 men and 785 women (male: female ratio of 0.8:1) with mean age of 14.8 years (range 2-48 years). Cold dissection was used in 674 patients and monopolar microdissection in 745 patients. The mean duration of surgery in the cold dissection group was 7 minutes (range 3.5-15 minutes) with average operative blood loss of 120 ml (range 35-150 ml), which included blood in suction bottle and tube, and the soaked gauze swabs, while in the monopolar microdissection group the mean duration of surgery was 3.2 minutes (range 2.2-9.5 minutes) and the average blood loss was 6 ml (range 0-23 ml). The difference in operative time between microdissection and cold dissection (3.2 versus 7 minutes) was statistically significant ($p$=0.001). Intraoperative blood loss was significantly less with microdissection tonsillectomy compared with cold dissection (6 ml versus 120 ml). A total of 27 patients developed post-tonsillectomy bleeding (a rate of 1.9%); 21 (3.1%) patients after using cold dissection, and 6 (0.8%) patients following the use of monopolar microdissection ($p$<0.001).

The rate of post-tonsillectomy bleeding in children and adults was studied. As **Table 1** shows, patients undergoing tonsillectomy by the cold dissection had significantly more than 3 times the risk to develop post-tonsillectomy hemorrhage compared with the monopolar microdissection technique. Similarly, children performing tonsillectomy by the cold dissection had significantly more than 14 times the risk to develop post tonsillectomy hemorrhage compared with the monopolar micro-dissection technique. In adults, no significant differences ($p$=0.307) were found in post tonsillectomy hemorrhage by type of dissection. On the other hand, adults performing tonsillectomy by the monopolar dissection had significantly more than 11 times the risk to develop post tonsillectomy hemorrhage compared to children. In the cold dissection, no significant difference ($p$=0.445) was found in post tonsillectomy hemorrhage among adults and children.

The rate of primary and secondary hemorrhage post-tonsillectomy using monopolar microdissection needle and cold dissection was studied in both groups (**Table 2**). Primary hemorrhage (within 24 hours of surgery) occurred in 5 patients (0.7%) while they were still in hospital (4 [0.6%] after cold dissection and one [0.1%] following monopolar microdissection). Twenty-two patients (1.6%) presented with secondary

**Table 1 -** Rate of post-tonsillectomy hemorrhage among different groups studied.

| Post-tonsillectomy hemorrhage | n | (%) | *P*-value | RR | 95% CI |
|---|---|---|---|---|---|
| ***Post tonsillectomy hemorrhage:*** | | | | | |
| Cold dissection (n= 674) | 21 | (3.1%) | 0.003 | 3.92 | 1.59 - 9.64 |
| Monopolar micro-dissection (n=745) | 6 | (0.8%) | | | |
| **Total** | **27** | **(1.9%)** | | | |
| ***Post tonsillectomy hemorrhage in children:*** | | | | | |
| Cold dissection (n= 438) | 12 | (2.7%) | 0.011 | 14.14 | 1.894 - 508.504 |
| Monopolar micro-dissection (n=517) | 1 | (0.2%) | | | |
| **Total** | **13** | **(1.3%)** | | | |
| ***Post tonsillectomy hemorrhage in adults:*** | | | | | |
| Cold dissection (n= 236) | 9 | (3.8%) | 0.307 | 1.75 | 0.597 - 5.154 |
| Monopolar micro-dissection (n=228) | 5 | (2.2%) | | | |
| **Total** | **14** | **(3.0%)** | | | |
| ***Post tonsillectomy hemorrhage using monopolar dissection:*** | | | | | |
| Adults (n= 228) | 5 | (2.2%) | 0.026 | 11.34 | 1.332 - 96.503 |
| Children (n=517) | 1 | (0.2%) | | | |
| **Total** | **6** | **(0.8%)** | | | |
| ***Post tonsillectomy hemorrhage using cold dissection:*** | | | | | |
| Adults (n= 236) | 9 | (3.8%) | 0.445 | 1.39 | 0.59 - 3.26 |
| Children (n=438) | 12 | (2.7%) | | | |
| **Total** | **21** | **(3.1%)** | | | |

RR - relative risk, 95% CI - 95% confidence interval

**Table 2 -** Rate of primary and secondary post-tonsillectomy hemorrhage using monopolar microdissection needle and cold dissection in both groups.

| Procedure | N | Primary hemorrhage (%) | Secondary hemorrhage n (%) | *P*-value |
|---|---|---|---|---|
| Monopolar microdissection | 745 | 1 (0.1) | 5 (0.7) | 0.218 |
| Cold dissection | 674 | 4 (0.6) | 17 (2.5) | 0.007 |
| **Total** | **1419** | **5 (0.4)** | **22 (1.6)** | **0.002** |

hemorrhage (between 3-8 days postoperatively) and included 17 (2.5%) patients from the cold dissection group, and 5 (0.7%) after the use of Colorado needle. The rate of secondary hemorrhage posttonsillectomy using microdissection was significantly less than by cold dissection ($p$=0.001). All patients were hospitalized and treated with antibiotics, analgesia, and intravenous fluids. Eleven of hospitalized patients (9 from the cold dissection group and 2 following monopolar microdissection) underwent surgical intervention to stop bleeding either by bipolar diathermy or suturing the anterior to the posterior tonsillar pillars. None of the patients needed blood transfusion.

**Discussion.** The use of diathermy to remove the tonsils was introduced in 1968[18] while the Colorado tip electro-microdissection needle was introduced into clinical practice in 1997,[12] and a number of applications were described. The tip itself is a finely machined, insulated, tungsten diathermy needle that fits any standard cautery handpiece. By reducing the surface area of the cautery device, high power densities can be maintained at relatively low wattage. The net result allows for less dissipation of energy as heat into the surrounding tissues, which results in a smaller zone of tissue necrosis than any other described modality. One of the advantages of monopolar diathermy tonsillectomy is reduction of the risk of hemorrhage following its use.[12] In this study, there was significant difference in the rate of bleeding using monopolar microdissection and cold dissection in children ($p$<0.001), where as in adults cold dissection resulted in statistically significant higher rate of bleeding than in microdissection ($p$<0.012). On the other hand, primary hemorrhage occurred in 5 patients (0.4%) and 22 patient (1.6%) developed secondary hemorrhage. The hemorrhage rate using microdissection (n=6) and cold dissection (n=21) was 0.8% and 3.1% which is comparable with other studies. It was also found that cold dissection tonsillectomy had a significantly higher secondary hemorrhage rate than microdissection ($p$<0.001). The cause of increased rate of secondary hemorrhage with cold dissection might be due to slower wound healing in adult or secondary infection. In children there was significant difference in hemorrhage rate between microdissection needle and cold dissection ($p$<0.001). It is not clear why there was such difference between the 2 methods in children, it might be due to the effect of the use of the sharp precise Colorado microdissection needle. A review of the literature reveals a rate of posttonsillectomy hemorrhage in the range of 0.2-6.5% by using different techniques (**Table 3**).

Previous studies demonstrated no meaningful differences between the 2 operative procedures[19] while this study has shown remarkable intraoperative reduction of blood loss (average 6 ml in monopolar compared with 120 ml in cold dissection). This is a significant achievement especially in children due to their smaller circulating blood volume in comparison with adults. There is inconsistency among published data in relation to the operative time of the 2 methods.[20-23] This is expected if more than one surgeon has contributed to the operative procedures, in contrast to the present study, which has been conducted by a solo operator. In this study, monopolar microdissection tonsillectomy appeared to be a faster technique with less hemorrhage than cold dissection. Also in this study, post-tonsillectomy bleeding using the Colorado needle was found to have a hospital readmission rate of 0.8% in comparison with the 3.1% following the use of the cold dissection technique.

The only limitation of the study was lack of comparison among all different used tonsillectomy techniques. This is due to the nature of the study between 2 commonly performed methods at the hospital with the same surgeon.

In conclusion, patients that underwent tonsillectomy using the monopolar microdissection (Colorado needle) had statistically significant less post-tonsillectomy bleeding rate and severity compared with those who underwent the cold dissection method. In this study, the use of the monopolar microdissection method (Colorado

**Table 3 -** Review of the literature of posttonsillectomy hemorrhage rate.

| Source | n | Technique | Rate (%) | | |
|---|---|---|---|---|---|
| | | | Overall | Primary | Secondary |
| Lowe et al[8] | 2083 | Cold dissection | 2.1 | NA | NA |
| | 323 | Monopolar | 6.5 | NA | NA |
| | 6427 | Bipolar | 5.2 | NA | NA |
| | 920 | Coblation | 4.6 | NA | NA |
| Lee et al[7] | 145 | Cold dissection | 5.5 | 0.0 | 5.5 |
| | 192 | Bipolar | 6.3 | 0.5 | 12.0 |
| Faulconbridge et al [9] | 1862 | Cold dissection | 3.5 | 2.0 | 5.0 |

NA - not applicable

needle) is recommended as it results in minimal blood loss and less post-tonsillectomy bleeding. In addition, the technique is easily learned, when compared with other complicated techniques (for example, Coblation or laser techniques).[10]

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