A time and cost analysis of the management of incomplete abortion with manual vacuum aspiration

P.D. Blumenthal and R.E. Remsburg

The Johns Hopkins University. Department of Obstetrics and Gynecology, Francis Scott Key Medical Center, 4940 Eastern Ave., Baltimore, Maryland 21224 (USA)

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Abstract

OBJECTIVES: Traditionally, management of incomplete abortion involves use of D&C or suction curettage in the operating room. Such management is costly and time-consuming. In order to potentially save time and money, we studied the use of manual vacuum aspiration curettage (MVAC) for the management of this problem. METHODS: Data on hospital charges and times (e.g. waiting time, procedure time) were obtained for all cases of incomplete abortion presenting to hospital between January 1990 and July 1992. Between January 1990 and July 1991, all cases were managed traditionally. After July 1991, all cases were managed using MVAC in either the emergency room or the labor ward. RESULTS: Compared to the use of electrical suction equipment in the operating theatre, MVAC procedures resulted in significant savings in terms of both waiting times and costs. Waiting time was reduced by 52% and procedure time was reduced from a mean of 33 min to 19 min (P < 0.01). Total hospital costs were reduced by 41% (P < 0.01). CONCLUSIONS: Use of manual vacuum aspiration curettage in the management of incomplete abortion can reduce hospital costs and save time for both patients and clinicians.

Keywords: Incomplete abortion; dilatation and curettage; Suction curettage; Manual vacuum aspiration curettage.

Introduction

The hospital-based management of incomplete abortion in the United States and other developed countries has remained basically unchanged for the last 25 years. Specifically in centers where the emergency room is the primary gateway into the hospital, patients who present to the emergency department with signs and symptoms of incomplete abortion, are assessed in the emergency department (ER) often by both the ER staff and, later, the gynecology resident and/or the attending physician. Subsequently, such patients are usually transferred to either the labor ward or the gynecology floor to await a D&C. Eventually, an evacuation procedure is usually performed by means of suction curettage (SC) under sedation or general anesthesia (GA) in the operating room. This chain of events rarely requires less than 4 h and often as much as 12–14 h.

In the developing world and in some US centers, a much simpler system, using either manual vacuum aspiration curettage (MVAC) or electrical suction curettage (SC) in the emergency area has been implemented [1–3].
In such scenarios, patients presenting to the emergency department with incomplete abortion are assessed and then seen by the gynecologist. At this point, after having evaluated the patient, the gynecologist performs an MVAC or SC procedure in the emergency department, in the outpatient surgical suite, or in the labor corridor utilizing either a labor delivery recovery room (LDR) or a procedure room. Usually after a 1–2 h observation period, the patient can be discharged home.

Although the technology for MVAC has been available for more than 20 years, its use has never become popular in the US or other developed countries. According to the manufacturer, only 21 hospitals in the United States currently make use of this equipment. The reasons for this are unclear but may be related to physician unfamiliarity with the device and/or unwillingness or lack of interest in trying new but ‘low tech’ instruments. Thus, in the US, no clinical trial exploring the cost benefit and patient convenience of MVAC for managing patients with incomplete abortion has ever been published [4–6]. Given the emphasis that is currently placed on cost effectiveness and appropriate use of technology, we examined the cost effectiveness of performing MVAC procedures either in the emergency room or on the labor corridor as an alternative to traditional suction curettage in the operating room.

Methods

This was an open, serial, quasi-experimental study, conducted between January 1990, and July 1992. From January 1990 until September 1991, the Emergency Department (ER) staff followed the usual routine in triaging and assessing patients suspected of having incomplete abortion. Once she had been triaged by the ER staff, the gynecologist saw the patient and, if it was established that the uterus was less than or equal to approximately 12 weeks size, she was prepared for a suction curettage and this was performed in the operating room as soon as a room was available. If, at the time the patient presented with incomplete abortion, conditions in the operating room were such that an SC procedure could not be expeditiously accommodated, the patient was sent to the gynecology floor until an operating theater was available. Patients were considered to have incomplete abortion if they had a positive pregnancy test, abdominal cramping and/or bleeding and evidence of an open cervix, tissue in the cervical os or other clinical signs of inevitable abortion or abortion in progress. Patients with missed abortion were not included.

After September 1991, once the diagnosis was established, an MVAC procedure was performed in the gynecology exam room of the emergency department. If, at the time the patient presented with incomplete abortion, conditions in the emergency department were such that an MVAC procedure could not be accommodated, the patient was taken to the labor corridor where the MVAC procedure was performed in any room (LDR or procedure room but not in an operating room) that was available. All procedures were performed by resident housestaff under the supervision of attending physicians who were familiar and practiced in the use of MVAC equipment. In both the SC and MVAC groups standard informed consent for the procedure was requested. IPAS double valve Gynecologic Aspiration Kits (International Projects Assistance Services, Carrboro, North Carolina) were used for the MVAC procedures. This equipment is displayed in Fig. 1. This double valve accepts canula sizes from 4 to 12 mm in diameter. Single valve equipment is also available which accept canulae only up to 7 mm in diameter.

If analgesia was required during an MVAC procedure, the standard outpatient protocol for procedural sedation/anesthesia in the emergency room (50–150 μg fentanyl, 1–3 mg medazolam) was followed. When the procedure was completed the patient was observed as an outpatient on the labor corridor or in
Manual vacuum aspiration

the emergency room to insure stable vital signs and recovery from any narcotic analgesics. She was then discharged home with a return appointment to the gynecology clinic in 1 week. For the SC procedures, analgesia and sedation was administered by the anesthesia department as is the custom in the operating rooms. In such cases sedation was achieved with a combination of short acting benzodiazepines and narcotics. The dosage used depended on the clinical judgment of the anesthesiologist that amnesia would be present and that sedation consistent with the perceived needs of the gynecologist was produced. In the operating room, unlike the emergency room or labor corridor, there was no limit as to the dosages which could be given. Although not a specific focus of this study, dosages given in the operating room were generally higher than those used in ambulatory settings. There were no patients for whom general anesthesia was used. Post procedure, the patient was observed briefly in the recovery room and then either discharged from the ambulatory surgical unit, or from the gynecology floor, depending on the location from whence she had been sent to the OR. Patients in both management groups

Fig. 1. IPAS Gynecologic Aspiration Kit. The kit consists of a 60 ml syringe with locking valve for the creation and maintenance of a vacuum and a variety of cannula sizes ranging from 6 to 12 mm diameter.
were similarly prepped and draped. The bladder was catheterized only if, after bimanual pelvic examination, it was felt to be distended and a potential encumbrance to the procedure.

To assess outcomes of this project, the following data were collected and analyzed.

(i) Time from Emergency Room admission to operation (wait time).
(ii) Time from Emergency Room admission to discharge home (total time).
(iii) Time required for the procedure (procedure time).
(iv) Cost of the procedure. The determinants for cost included: (a) total hospital charges (the hospital bill), (b) equipment and supply charges (central sterile supply), (c) charges for drugs used (anesthesia), (d) hospital/admission related charges (e.g. bed, room, theatre, emergency department charges).
(v) Complications of the procedure (e.g. excessive patient discomfort, medication related complications, uterine perforation, unintended major surgery, transfusion required due to procedural complication, incomplete procedure, infection, death).

Comparisons concerning time, complications, and charges were made by obtaining relevant information from the charts of patients who underwent either SC in the operating room or MVAC. Cost comparisons were made using the line-itemized hospital bill for patients having each procedure. Such bills included specific line-items for supplies, medications (including analgesics, antibiotics, and i.v. fluids), operating room usage time, and emergency department usage. Charges on the bill were also reflective of both equipment costs and staff time. The price of donated IPAS equipment ($15.00) was added to the calculated total costs for those patients having an MVAC procedure. This is what a provider ordering this equipment from the manufacturer would pay for an ‘MVAC kit’.

All observed times were reflective of entries in the medical records of patients. It is standard practice to document on the record the time at which a patient was admitted to or discharged from a nursing unit. For continuity, the discharge time was recorded as the time at which the order for discharge was taken off by the ward clerk. The procedure time was documented as the time the procedure began and finished as noted by the nursing or anesthesia staff, also a standard chart entry. Statistical analysis was performed using t-tests for examining differences between means.

Results

Demographically the groups were identical with no significant differences in age or parity. Although a statistically significant difference in gestational age was observed (Table 1), this was not felt to be medically significant. Also, although patients may have differed concerning gestational age there was no patient whose uterus was larger than 12 weeks' size. Histopathology confirmed the diagnosis in all cases.

The results for cost-related categories are displayed in Table 1. MVAC procedures resulted in significant reductions in charges. Mean total hospital charges were reduced from $11404 to $827 for SC and MVAC, respectively, a decrease of 41% ($P < 0.01). Anesthesia charges, admission charges, and expenses related to sterile supplies were reduced by 93, 92, and 54%, respectively ($P < 0.01).

Time-related outcomes are displayed in Table 2. This change in procedure and venue reduced total hospital stay by more than 70%, from a mean stay of approximately 19.3 h for SC patients to a mean total stay of 5.8 h for MVAC patients ($P < 0.01). The time required for the procedure itself was also reduced from a mean of 33 min for the SC group to a mean of 19 min for the MVAC group ($P < 0.01). Likewise, waiting time (the time spent waiting for a procedure once the diagnosis has been established) was reduced by 52% when MVAC was instituted ($P < 0.01).
Table 1. Cost comparison of manual vacuum aspiration and electric suction curettage.

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<th>MVAC $n=17$</th>
<th>SC $n=18$</th>
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<tbody>
<tr>
<td></td>
<td>Mean (S.D.)</td>
<td>Mean (S.D.)</td>
</tr>
<tr>
<td>Admission charges</td>
<td>$10 (29)$</td>
<td>$137 (58)\ast$</td>
</tr>
<tr>
<td>Central supply charges</td>
<td>$58 (44)$</td>
<td>$125 (106)\ast$</td>
</tr>
<tr>
<td>Anesthesiology charges</td>
<td>$6 (22)$</td>
<td>$85 (57)\ast$</td>
</tr>
<tr>
<td>Total hospital charges</td>
<td>$827 (492)$</td>
<td>$1404 (567)\ast$</td>
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\*P < 0.01.

Among the MVAC patients only patients whose procedures were performed in the labor corridor are included in this analysis. Unfortunately, nursing and medical staff in the emergency room were neither as motivated nor as enthusiastic about this study as originally hoped. Because of this, it became difficult to arrange for a procedure to be performed in the emergency room and most procedures were eventually performed in the labor corridor. Thus, because very few procedures performed in the emergency room were available for analysis, the costs for the MVAC procedure are significantly higher than they would have been if procedures had been performed predominantly in the ER. For the three cases that were managed in the emergency room or in a procedure room in the gynecology clinic, total charges were less than $200.

There were neither procedural complications nor need for re-evacuation in any patient. Although this project was not designed to assess differences in safety and efficacy between the two procedures, there is no reason to believe they are not equivalent [8–11].

Discussion

It is readily apparent that significant savings of both time and money resulted when traditional suction curettage procedures were replaced by MVAC procedures. By introducing a procedure that could be performed almost anyplace in the hospital, patients were no longer required to wait until an operating theater became available in order to be treated for a painful and emotionally distressing problem. Furthermore, at our institution, because patients with incomplete abortion

Table 2. Time comparison of manual vacuum aspiration and electric suction curettage.

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<th>MVAC $n=17$</th>
<th>SC $n=18$</th>
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<tbody>
<tr>
<td></td>
<td>Mean (S.D.)</td>
<td>Mean (S.D.)</td>
</tr>
<tr>
<td>Gestation</td>
<td>8 weeks (2.2)</td>
<td>10 weeks (2.8)\ast</td>
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<tr>
<td>Waiting time</td>
<td>3.45 h (2.0)</td>
<td>7.18 h (4.9)\ast</td>
</tr>
<tr>
<td>Procedure time</td>
<td>19 min (9.0)</td>
<td>33 min (8.0)\ast</td>
</tr>
<tr>
<td>Total hospital time</td>
<td>5.66 h (2.3)</td>
<td>19.26 h (11.1)\ast</td>
</tr>
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\*P < 0.01.
most commonly presented in the afternoon or evening when operating room staff and the number of available operating rooms are reduced, long waits for an operating theater necessitated admission to a hospital room. If a similar temporal pattern exists at other institutions, a similar pattern of waiting and possible admission to either a hospital room or an observation area may also be prevalent. For patients who work and who have families, any reduction in waiting time and total time in hospital is of considerable benefit. This is equally true for the medical staff. Being able to perform a procedure as soon as the need is apparent offers the medical staff considerable advantages over a system which may involve a long wait until a room or equipment becomes available. As part of this project a survey was conducted among the 18 institutions in the Baltimore area telephone book about their procedures for performing uterine evacuation in cases of incomplete abortion. In 16 of the 18 institutions contacted, uterine evacuation was performed in an operating room, either in the surgical suite or in the labor area. Long waits for an operating theater were uniformly decried as was the inability to routinely perform procedures in the emergency area, or in a procedure area such as we have done. Thus, while there are undoubtedly hospitals where management of incomplete abortion has been moved out of the operating room, if a cross section of hospitals in the Baltimore area serves as an example of hospitals across the US, such hospitals would appear to be a minority.

As we have also demonstrated, eliminating the need for a staff- and cost-intensive operating theater (whether in the labor corridor or in the operating room) resulted in considerable cost reductions, without sacrificing standards for clinical care. For the purposes of this analysis we have equated hospital related charges with costs. Although ‘charges’ are not always reflective of ‘costs’, they are reflective of what the procedure would cost the health care system if all charges were actually paid as billed. To be sure, while such cost reductions may result in overall revenue reduction for the hospital, the benefits of lower health care costs far outweigh the disadvantages of reduced hospital revenue. For state-supported patients the taxpayer ultimately saves money, and for patients with private or HMO related insurance, lower insurance rates may ultimately result from such cost reductions. In the developing world, where incomplete abortion is a major health problem and where facilities and resources are constrained, lower costs mean increased availability of services.

It could be argued that the procedure itself was only a small component in the cost and time reductions observed in this study and that the main factor responsible for the observed results was the change in venue. To be sure, significant time savings would probably be realized if suction machines were available at various locations in the hospital, or could be transported between them. However, part of the attraction of the MVAC technique is that it can be performed any place where an acceptable procedure room environment can be provided without any additional capital equipment outlay. While it would be possible to have several suction machines available at various hospital locations (e.g., emergency, labor and delivery, operating room, clinic) this is an expensive option as hospital grade suction machines cost approximately $2200 dollars when purchased in the United States. Likewise, while it might also be possible to bring an electric suction machine to the location where the procedure is to be performed, such an option seems unnecessarily cumbersome and likely to result in lost or broken machinery. Most importantly, the actual procedure time required for each procedure was 42% less in the MVAC group. Since the patients in the two groups were similarly prepped and draped this difference may result from the use of simpler, less cumbersome equipment. It may also be due to the fact that in MVAC procedures the specimen is immediately available for inspection by the operator as opposed to SC procedures where
the catheter/tubing apparatus must be disconnected from the receptacle and the sock containing the aspirate removed before the specimen can be inspected. If further suctioning is required after curettage, the equipment must be reassembled.

In summary, for the management of incomplete abortion, MVAC in a procedure room setting appears to be an attractive alternative to traditional suction curettage procedures in an operating theatre. In hospitals where incomplete abortion is already managed in the ER or in an outpatient procedure room some additional cost and time savings may result by using this simple, portable and inexpensive equipment. While some training is required to acquaint the provider with proper use of the syringe and flexible cannulae and with slight differences in the feel of MVAC procedure, the training investment is not great. Given the time and cost savings which we have demonstrated, more use should be made of the MVAC procedure for the management of incomplete abortion in the outpatient setting.

Acknowledgments

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References