A Comparison of the Mogen and Gomco Clamps in Combination With Dorsal Penile Nerve Block in Minimizing the Pain of Neonatal Circumcision

Peter S. Kurtis, MD*‡; Hema N. DeSilva, MBBS*‡; Bruce A. Bernstein, PhD*‡; Lillian Malakh, BA‡; and Neil L. Schechter, MD*‡

ABSTRACT. Objectives. 1) To compare the Mogen and Gomco clamps with regard to pain experienced during neonatal circumcision, and 2) to assess neonatal circumcision pain with and without dorsal penile nerve block (DPNB).

Design/Methods. A randomized, controlled, non-blinded clinical trial; 48 healthy, full-term infants were randomized into one of the following four groups: Gomco vs Mogen with (+) or without (−) DPNB. DPNB+ infants were injected with 0.8 mL of 1% lidocaine before circumcision. DPNB− infants received no placebo injection. Heart rate, respiratory rate, and oxygen saturation (SaO₂) during the procedure were monitored and data transferred to computer files by using the DataLab software system. Crying was recorded on videotape. Pre- and postcircumcision saliva samples for cortisol analysis were collected. Heart rate, respiratory rate, SaO₂, cortisol changes, and duration of crying were evaluated statistically with two-way analyses of variance and t tests.

Results. The type of clamp but not the use of anesthesia was significantly associated with the length of the procedure (mean Mogen time, 81 seconds; mean Gomco time, 209 seconds) and percentage of respiratory rate change. The use of anesthesia but not the type of clamp was significantly associated with percentage of crying time and percentage of SaO₂ change during the procedure. Heart rate changes and total crying time were significantly associated with both the type of clamp and the use of anesthesia. Neither clamp type nor anesthesia status was significantly associated with salivary cortisol changes, although the mean increase for the DPNB− group was approximately twice that for the DPNB+ group. Fifty-six percent of infants circumcised with the Mogen clamp and DPNB did not cry at all during the procedure.

Conclusions. DPNB is effective in reducing neonatal circumcision pain with either the Mogen or the Gomco clamp. For a given anesthesia condition, the Mogen clamp is associated with a less painful procedure than the Gomco. The Mogen clamp with DPNB causes the least discomfort during neonatal circumcision. Pediatrics 1999;103(2). URL: http://www.pediatrics.org/cgi/content/full/103/2/e23; circumcision, dorsal penile nerve block, neonatal pain, newborn.

ABBREVIATIONS. HR, heart rate; RR, respiratory rate; SaO₂, oxygen saturation; DPNB, dorsal penile nerve block; ANOVA, analysis of variance.

Circumcision of the newborn male is one of the most commonly performed surgical procedures in the United States. Approximately 61% of newborn American male infants were circumcised in 1992, totaling 1.2 million procedures. Considerable regional variation exists in the rate of circumcision as well as in the area of specialization of the person performing the procedure. A recent survey by Stang and Snellman indicates that 69.6% of male infants are circumcised in the Northeast, 64.7% in the South, 34% in the West, and 80.1% in the Midwest. In the above survey, 36% of circumcisions were performed by pediatricians, 58% by obstetricians, and 5% by family practitioners.

Although considerable controversy exists regarding the medical value of circumcision, the evidence is overwhelming that it is a painful procedure. Multiple studies have shown increased heart rate (HR), respiratory rate (RR), and stress hormone production, as well as decreased oxygen saturation (SaO₂) during circumcision. These are all nonspecific markers associated with stress. Infants also display a specific pattern of facial expression classically associated with pain. Some studies have suggested that in addition to causing immediate pain, circumcision may have consequences that persist beyond the perioperative period. Dixon et al and Marshall et al both reported that infants cry frequently for the first 36 to 72 hours after circumcision and feed less well. They also reported that there is a variation in their normal state. Taddio et al reported that infants who were circumcised without anesthesia reacted more intensely to their 4- and 6-month immunizations compared with infants who were uncircumcised or were circumcised with anesthesia.

There is a broad body of information now available on techniques that are believed to reduce the pain associated with circumcision. In fact, American medical literature stated almost 100 years ago that humanitarian considerations require the use of anesthesia for circumcision of the newborn, and that it

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was safe to do so. The most well-studied approach is the dorsal penile nerve block (DPNB), a technique described by Fulton in 1958, and by Kirya and Werthmann in 1978. Since that time, many studies involving thousands of infants have demonstrated the safety and efficacy of this approach. Other regional anesthesia techniques that have demonstrated some efficacy include topical anesthesia with eutectic mixture of local anesthetics (EMLA) and ring block of the penis. None of these have been studied as comprehensively as DPNB. A recent comparison between EMLA and DPNB has shown DPNB to be a significantly more effective means of pain control for circumcision. In addition to local anesthetic techniques, others have reported on the use of a more comfortable circumcision restraint, the administration of a pacifier dipped in sucrose, postoperative local anesthesia, and postoperative systemic analgesia.

Although there is a great deal of literature supporting anesthetic and analgesic practices, the American Academy of Pediatrics Task Force on Circumcision did not endorse the use of local anesthesia in its most recent position statement, citing the inadequacy of available data. In addition, despite the fact that most circumcisions are performed by obstetricians, no policy statement by the American College of Obstetricians and Gynecologists advocating pain management for circumcision has been developed. In fact, only 25% of obstetricians surveyed in the previously mentioned study reported using anesthesia for circumcisions.

Most circumcisions (67%) are performed by using the Gomco clamp, a device consisting of a metal bell that fits over the glans and under the foreskin, and a flat metal clamp that fits over the bell. A common alternative (19%) has been the Plastibell clamp, which is a plastic protective bell that is placed over the glans and under the foreskin. A suture is placed around the entire foreskin, which will eventually necrose and fall off after several days. The Mogen clamp (see Fig 1), which is traditionally used in Jewish ritual circumcisions by Mohels (ritual circumcisers), is used by only 10% of physicians. Mogen, the Hebrew word for shield, is a flat metal device with a narrow opening through which the foreskin, but not the glans, can be pulled through. After pulling the foreskin through the clamp, the clamp is locked. This protects the glans, which remains below the clamp, and allows the foreskin above the clamp to be safely removed. The Mogen clamp involves substantially less manipulation, does not require a dorsal slit, and allows for a significantly quicker procedure. Although the Mogen clamp has these apparent advantages, no formal investigation has explored its time- and pain-saving features. In addition, no information is available concerning its use with DPNB, specifically in comparison with the more commonly used Gomco clamp. This study was designed to address these questions.

METHODS

Subjects
Infants were eligible for the study if they met the following criteria: full-term male born by cesarean section or vaginal delivery, no magnesium sulfate given to the mother within 48 hours of delivery, 5-minute Apgar score 7 or higher, no maternal history of diabetes, and no blood drawn from the infant at least 2 hours before the procedure.

A total of 48 infants were enrolled in the study and randomized into one of the following four groups: M+ (16), Mogen clamp with DPNB; M− (16), Mogen clamp without DPNB; G+ (8), Gomco clamp with DPNB; and G− (8), Gomco clamp without DPNB. All circumcisions were performed by two of the authors (P.S.K. and H.N.D.), who are both neonatologists. Circumcisions with the Gomco clamp were all performed by the same individual (H.N.D.). The physicians performing the circumcisions were not blinded to the anesthesia status.

Procedure
Informed consent was obtained from parents of eligible infants based on entry criteria. Infants enrolled were randomized into one of the four anesthesia/clamp groups. The infants were fed 1 to 2 hours before the procedure. With the infant still in the bassinet, a saliva sample was collected for salivary cortisol analysis. Salivary secretion was stimulated with a small amount of citric acid crystals, a dental cotton roll was placed in the mouth, and absorbed saliva extracted from the cotton roll with a syringe. HR, RR, and pulse oximetry monitoring was then put in place (H. P. Merlin Monitor) and preprocedure baseline measurements were made. The infant was placed on a circumcision restraint board (Circumstraint, Olympic Medical, Seattle, WA), given a pacifier, and allowed to calm. Recording of facial expression and crying via videotape was initiated after the infant was placed on the Circumstraint. The infant was prepped, draped, and allowed to calm. Those receiving DPNB were then injected bilaterally with 0.4 mL of 1% lidocaine with a 30-gauge needle. The infant was observed for complications during injection (ie, hematoma, or piercing of artery or vein without hematoma). Five minutes was allowed to elapse for all infants before starting the circumcision procedure, regardless of the anesthesia status.

The circumcision was then performed, with the following steps: For the Mogen clamp: lysis of adhesions, dilating and retraction of the foreskin, lysing remaining adhesions, bringing foreskin forward, placement of the Gomco bell and pulling up foreskin over the bell, placement of the clamp and release of the clamp. For the Gomco clamp: lysis of adhesions, placement of the dorsal hemostat, cutting a dorsal slit, retraction of the foreskin, lysing remaining adhesions, pulling the foreskin forward, placement of the Gomco bell and pulling up foreskin over the bell, application of pressure, removal of foreskin, and release of the clamp.

After circumcision, the infant remained on the Circumstraint for approximately 2 minutes for a final vital signs measurement and then returned to the bassinet. A second saliva collection was made 30 minutes after the procedure.

Measures
HR, RR, and SaO2 were monitored and recorded in computer files via the Datalab acquisition and analysis system (PBO Developments, Montreal, Quebec, Canada). The system features an analog-to-digital interface and software that records data in numerical files and has graphic and statistical analysis capabilities. The system also allows marking of specific points in time for subsequent analysis (eg, the point at which lysing adhesions began can be identified in the captured data and graphic display). The program was configured to sample at a rate of 20/s, displayed in 10-second blocks.

A research assistant (L.M.L) calculated cry duration for specific phases of the procedure, which were marked with verbal cues by reviewing the videotape and measuring crying time in seconds by using a stopwatch.

Salivary cortisol was analyzed by radioimmune assay by our hospital laboratory and expressed as micrograms per deciliter. The following variables were calculated:

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The circumcision was then performed, with the following steps: For the Mogen clamp: lysis of adhesions, dilating and retraction of the foreskin, lysing remaining adhesions, bringing foreskin forward, applying the dorsal hemostat, placing of the clamp, removal of the foreskin, and release of the clamp. For the Gomco clamp: lysis of adhesions, placement of the dorsal hemostat, cutting a dorsal slit, retraction of the foreskin, lysing remaining adhesions, pulling the foreskin forward, placement of the Gomco bell and pulling up foreskin over the bell, application of pressure, removal of foreskin, and release of the clamp.

After circumcision, the infant remained on the Circumstraint for approximately 2 minutes for a final vital signs measurement and then returned to the bassinet. A second saliva collection was made 30 minutes after the procedure.

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Salivary cortisol was analyzed by radioimmune assay by our hospital laboratory and expressed as micrograms per deciliter. The following variables were calculated:
TABLE 1. Pain Parameters During the Procedure*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mogen Clamp</th>
<th>Gomco Clamp</th>
<th>Sign*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With DPNB</td>
<td>No DPNB</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of HR change</td>
<td>8.0 ± 7.3</td>
<td>29.1 ± 9.0</td>
<td></td>
</tr>
<tr>
<td>% of RR change</td>
<td>0.4 ± 6.7</td>
<td>−4.5 ± 9.5</td>
<td></td>
</tr>
<tr>
<td>% of Satur. change</td>
<td>−1.0 ± 1.4</td>
<td>−1.5 ± 1.6</td>
<td></td>
</tr>
<tr>
<td>Procedure time (sec)</td>
<td>81.3 ± 19.5</td>
<td>80.9 ± 19.7</td>
<td></td>
</tr>
<tr>
<td>Procedure crying (sec)</td>
<td>22.7 ± 31.9</td>
<td>75.6 ± 22.1</td>
<td></td>
</tr>
<tr>
<td>% of procedure crying</td>
<td>31.3 ± 41.6</td>
<td>92.9 ± 17.5</td>
<td></td>
</tr>
<tr>
<td>Total crying (sec)†</td>
<td>84.8 ± 83.9</td>
<td>99.5 ± 34.3</td>
<td></td>
</tr>
<tr>
<td>Crying injection to lysing (sec)</td>
<td>62.1 ± 57.0</td>
<td>23.9 ± 31.5</td>
<td></td>
</tr>
<tr>
<td>Cortisol increase‡</td>
<td>0.48 ± 1.1</td>
<td>1.27 ± 1.0</td>
<td></td>
</tr>
<tr>
<td>% of cortisol increase‡</td>
<td>63.5 ± 92.4</td>
<td>208.7 ± 239.3</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: DPNB, dorsal penile nerve block; HR, heart rate; RR, respiration rate.
* "Procedure" pain parameters measured from beginning lysing adhesions to 1 minute after closing the final clamp.
† Total crying = from injection to closing the final clamp.
‡ Salivary/cortisol difference from before (before placing the infant on the circumstraint) to after (30 minutes after completion of the circumcision) the procedure.

TABLE 2. Differences in Pain Parameters, by Clamp

<table>
<thead>
<tr>
<th>Mogen</th>
<th>Gomco</th>
<th>Sign*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procedure time (sec)</td>
<td>81.1 ± 19.3</td>
<td>208.9 ± 60.9</td>
</tr>
<tr>
<td>Total crying time (sec)</td>
<td>92.2 ± 63.5</td>
<td>164.8 ± 72.5</td>
</tr>
<tr>
<td>% of HR change</td>
<td>18.6 ± 13.4</td>
<td>30.8 ± 14.7</td>
</tr>
<tr>
<td>% of RR rate change</td>
<td>−2.0 ± 8.5</td>
<td>5.0 ± 8.1</td>
</tr>
</tbody>
</table>

Abbreviations: HR, heart rate; RR, respiration rate.
* Two-tailed t test.

1. Length of the procedure was calculated in seconds from the DataLab file. The procedure time was defined as the time from initiation of lysing of adhesions to the removal of the foreskin.
2. Changes in mean HR, RR, and Satur. during the procedure were calculated as actual and percent increase or decrease relative to baseline, defined as the mean for the 60 seconds immediately before initiation of the procedure. To provide a more complete assessment of the procedure’s effect on these parameters, data were averaged from the initiation of lysing adhesions to 60 seconds after closing the clamp. The strategy of summarizing means was used, because the Gomco procedure requires more time than the Mogen procedure.
3. Total crying time (from injection to removal of foreskin) was assessed in seconds. Crying during the procedure was expressed in seconds and as percentage of the total procedure time.
4. Salivary cortisol changes were calculated as actual and percent increase or decrease, comparing post- with preprocedure samples.

Data Analysis

Pain parameter differences comparing neonatologists for the Mogen clamp procedures were assessed with two-tailed, independent sample t tests. Two-way analysis of variance (ANOVA) models with clamp and anesthesia as main effects, a clamp/anesthesia interaction effect, and HR, RR, Satur., crying time, and cortisol changes as outcomes were used to assess the impact of clamp and anesthesia on pain response parameters. When initial ANOVAs were significant, Tukey’s studentized range tests were used for posthoc analyses of differences between group pairs.

RESULTS

No significant differences between neonatologists were found for any of the outcome measures, ie, HR, RR, Satur., cortisol changes, and total and procedure crying time. Data from all procedures by both neonatologists were therefore combined for subsequent analyses. Data for all parameters assessed, grouped by clamp/anesthesia condition, are summarized in Table 1.

Procedure Time

As indicated in Table 1 and Table 2, Gomco procedures required approximately 2.5 times as long to complete as Mogen procedures (mean, 208.9 seconds vs 81.1 seconds). The clamp effect was significant (F1,44 = 116.5; P < .0002) and independent of the use of DPNB. DPNB was not significantly associated with procedure length: Mogen procedures were almost of identical length with or without DPNB, whereas G- procedures were slightly longer (19 seconds on average) but not statistically longer than G+ procedures (Tukey 95% confidence interval = −20.2–57.7).

HR

Mean HR during the procedure increased for all clamp/anesthesia group combinations (see Table 1 and Fig 2), ranging from an 8% increase in the M+ group to a 38% increase in the G− group. Both clamp (F1,44 = 15.7; P < .0002) and DPNB (F1,44 = 32.6; P < .0004) were significant effects, indicating that the use of the Mogen clamp was associated with less increase in HR independent of anesthesia status, and that for either clamp infants circumcised with DPNB had less of a HR increase. Posthoc analysis indicated that M+ procedures had significantly less HR increase than M− and G+ procedures, and that the G+ HR in-
crease was significantly less than the G− HR increase.

**RR**

Type of clamp ($F_{1,44} = 7.7; P < .008$) but not the use of anesthesia was significantly associated with RR changes during the procedure (see Table 1 and Fig 3). Gomco procedures, with and without anesthesia, had a mean RR increase of approximately 5%. RR was virtually unchanged among M+ infants, whereas a mean 4.5% decrease was seen for M− infants. Posthoc analysis showed the difference to be significant with M− compared with G+ and G− groups.

**SaO2**

As a result of a calibration problem, the SaO2 data from the first 8 cases were unavailable; thus the SaO2 analyses included 40 cases (13 M+, 12 M−, 7 G+, and 8 G−). The SaO2 decrease during the procedure ranged from 1% for the M+ group to 2.4% for the for the G− group (see Table 1). By ANOVA, DPNB was shown to be of borderline significance ($F_{1,36} = 4.0; P = .055$), whereas the clamp type was not significant.

**Crying**

Crying was assessed from several perspectives. With respect to the procedure, the type of clamp used ($F_{1,44} = 60.2; P < .0001$) and whether DPNB was given ($F_{1,44} = 67.5; P < .0001$) were both significantly associated with the amount of time the infants cried, ie, more for Gomco procedures than Mogen procedures and more for infants who were not anesthetized (see Table 1 and Fig 4). The clamp/anesthesia interaction effect was also significant in association with seconds of crying during the procedure ($F_{1,44} = 10.0; P < .003$), suggesting that crying was reduced more with DPNB in Gomco than in Mogen procedures. Posthoc analyses found that all group pair differences in crying time were significant with the exception of the M− and G+ groups.

The longer time required for Gomco procedures was an obvious factor underlying these findings. When percentage of procedure spent crying was the outcome, anesthesia ($F_{1,44} = 33.9; P < .0001$) but not clamp was significant (see Table 1 and Fig 5). Posthoc analyses provided the identical picture; ie, differences were significant only between group pairs with different anesthesia conditions. Nonanesthetized infants cried during nearly the entire procedure (mean, 91.0%) compared with about one-third of the procedure (mean, 34.8%) in the DPNB group. Nine infants in the DPNB group did not cry at all during the procedure. These were all in the M+ group; ie, 56% of those circumcised with DPNB and the Mogen clamp did not cry at all during the procedure.

In summary, DPNB was consistently associated with less crying during the procedure. For a given anesthesia condition, infants cried less during the procedure when circumcised with the Mogen clamp, but not less as a percentage of procedure time.

We also explored differences in total crying from injection, or an analogous time period for DPNB− infants, through the end of the procedure (see Table 1 and Table 3). Clamp ($F_{1,44} = 15.4; P < .0004$) and DPNB ($F_{1,44} = 9.8; P < .02$) were significant effects, indicating that the Mogen clamp was associated with less crying, and that infants who received DPNB cried less overall, even when the crying from the injection was included. The clamp-anesthesia interaction term was also significant ($F_{1,44} = 5.5; P < .03$), indicating that DPNB, although reducing crying significantly with either clamp, decreases crying more with the Gomco compared with the Mogen clamp. DPNB resulted in a mean of 31.5 seconds more crying time from anesthetic injection to beginning of lysing adhesions, a difference that was significant ($P < .02$) but not large enough to offset the benefit in reduced crying time during the procedure itself (see Table 3).

**Salivary Cortisol**

Preprocedure compared with postprocedure salivary cortisol levels were not significantly correlated with clamp or DPNB, whether expressed as an actual increase or percent increase (see Table 1). Cortisol increase in the nonanesthetized groups was approx-
approximately twice that of those receiving DPNB (see Table 3), a difference that approached but did not reach statistical significance.

**DISCUSSION**

There is ample evidence in the literature that circumcision performed without anesthesia is both painful and distressing for the infant regardless of the method used. Our study is the first to compare the Mogen clamp with the more commonly used Gomco clamp, using standard physiologic parameters to assess pain. The Mogen clamp is significantly faster and easier to use than the Gomco clamp, as it requires much less manipulation of the foreskin. In our study, the average procedure time with the Mogen clamp was 81 seconds, compared with 210 seconds with the Gomco clamp. It should be noted as well that other studies using the Gomco clamp report a procedure time ranging from 5 to 15 minutes.27

Our data reconfirm that DPNB is an extremely effective method of reducing pain during circumcision. This is most clearly demonstrated by the dramatic decrease in crying time when DPNB is used. The most obvious observation was that nonanesthetized infants cried virtually throughout the entire procedure. Using a DPNB together with the Mogen clamp resulted in the least overall pain for the infant. However, the addition of DPNB to the Gomco clamp produced one of the most dramatic improvements, as shown by the decrease in crying time during the procedure from 190 to 70 seconds.

The most striking finding was that more than half of all study infants circumcised with a Mogen clamp and DPNB did not cry at all. The injection itself seemed to add negligibly to the discomfort of the procedure. A 30-gauge needle was used in all cases, and the infants only cried briefly after being injected; 1% lidocaine has an acidic pH of 6.5, which may add to the discomfort of the injection. Studies in adults have shown some reduction in discomfort by buffering the lidocaine with sodium bicarbonate to a pH of 7.4.28 However, a study in newborns receiving DPNB did not show any advantage of buffering the lidocaine.20 The study does not mention what gauge needle was used, and therefore it is not clear whether buffering the lidocaine was not effective or whether the pain was caused by piercing the skin, which would not be expected to be alleviated by buffering the lidocaine. In previously reported studies of DPNB, a 27-gauge needle was used for the injection, including the study by Kirya and Werthmann.13,27

Concerns have been raised regarding the safety of the DPNB, suggesting the need for further evaluation before encouraging its widespread use.26,29 We looked for complications of the DPNB at the 2-week well-child visit. We evaluated the infants for any visible signs of injury, discoloration, or swelling at the site of injection or elsewhere on the shaft or glans. Although our sample size was small for the purpose of assessing the safety of DPNB, there were no noted instances of any of the above-mentioned complications. However, our combined clinical experience consists of several thousand circumcisions using DPNB, and we have not seen any clinically significant complications associated with its use. An occasional hematoma or bleeding at the frenulum has been seen, but they have always resolved without sequelae. We believe that the safety of the DPNB has been previously established by prospective evaluations reported in the literature.14

Occasional reports have suggested concern regarding the safety of the Mogen clamp.30 Our combined clinical experience consists of at least 5000 circumcisions using the Mogen clamp both with and without DPNB, and we are not aware of any injuries or complications related to its use in our practice. Occasional complications of circumcisions performed by others have been brought to our attention, primarily involving excessive bleeding at the frenulum.

### Table 3. Differences in Pain Parameters, by Anesthesia Condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>DPNB</th>
<th>No DPNB</th>
<th>Sign*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total crying (sec)</td>
<td>94.6</td>
<td>138.1</td>
<td>.04</td>
</tr>
<tr>
<td>% of procedure crying</td>
<td>34.8</td>
<td>91.0</td>
<td>.0001</td>
</tr>
<tr>
<td>Crying injection to lysis (sec)</td>
<td>55.9</td>
<td>24.4</td>
<td>.0169</td>
</tr>
<tr>
<td>% of HR change</td>
<td>13.3</td>
<td>32.1</td>
<td>.0001</td>
</tr>
<tr>
<td>% of O₂ saturation change</td>
<td>1.0</td>
<td>1.8</td>
<td>.07</td>
</tr>
<tr>
<td>Cortisol increase (μg/dL)</td>
<td>0.52</td>
<td>1.06</td>
<td>.002</td>
</tr>
</tbody>
</table>

Abbreviations: DPNB, dorsal penile nerve block; HR, heart rate.

*Two-tailed t test.

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and rare minor injuries to the urethral meatus. These incidents, as well as other reports in the literature relating to complications with the Mogen clamp, have most likely been the result of improper application of the device. Certainly, any medical device used incorrectly has the potential to cause harm.

The simplicity and speed of the procedure with the Mogen clamp is in part because it does not have a protective bell that fits over and protects the glans, as do the more commonly used Gomco and Plastibell devices. The Mogen, however, by the nature of its design, has an aperture that is impossible to open more than several millimeters wide, and therefore it is not possible to catch the glans in the clamp if properly applied. No studies to date have directly compared the complication rates of the three commonly used clamps, and therefore it is not possible to claim that one type of clamp is safer than another in well-trained hands. As our institution is a teaching hospital, we have taught countless physicians to perform circumcisions with the Mogen clamp. Because of the simplicity of the device, there is a relatively short learning curve to mastering the procedure. Most residents are competent to perform the procedure after having performed 10 to 15 circumcisions under our supervision during their 1-month newborn medicine rotation.

Our study did not include any comparison with the Plastibell device. Although nationally the Plastibell device is used twice as often as the Mogen,1 it is not used in any hospital locally, and none of the study participants have any familiarity with its use. Because of its popularity in many parts of the country, however, evaluation and comparison of the Plastibell device with the Mogen and Gomco clamps would certainly be warranted.

In our study, all procedures with the Gomco clamp were performed by one investigator (H.N.D.), as the other investigator (P.S.K.) had no previous experience with the Gomco clamp. Although this necessary compromise had the potential for biasing the results, no differences in any outcome measures were seen in any parameters that were able to be compared for both investigators. We therefore believed it was appropriate to combine all data, ie, HR, RR, SaO₂, cortisol changes, and total and procedure crying time for both investigators, for subsequent analyses.

That salivary cortisol changes did not reach statistical significance was somewhat surprising. Our findings were, however, in the direction that we predicted, except for the Gomco without DPNB group. There were only eight infants in this group, so sample size may have been a factor. Some infants in this group had lower cortisol levels after circumcision than before the procedure. This may just be an anomaly, or it may have been because of an undetected problem with the assay. It is possible that salivary cortisol measurement may not be a useful means of differentiating procedure-related pain from the stress of being strapped down to the circumcision restraint. It is also possible that a larger sample size would help clarify this; however, we no longer feel that using nonanesthetized controls for research is ethical.

RR in infants is typically reported to increase with pain. In our study, however, infants circumcised with a Mogen clamp without DPNB actually had lower RR during the procedure compared with baseline, whereas those circumcised with DPNB had no significant change in RR. The reason for this apparent discrepancy became clear during the study, as infants who began to cry at the onset of a painful stimulus in effect were holding their breath. By 1 minute after initiation of the painful stimulus they began breathing more quickly. Therefore, the mean RR decrease for the Mogen without DPNB group reflected the relatively short time for the procedure (mean, 81 seconds). The longer time required for the Gomco procedure provided enough time to recover from the breath holding, and a mean increase in RR was seen accordingly.

**CONCLUSIONS**

This study has shown that the pain of circumcision can be minimized or eliminated by the use of anesthesia as well as by the choice of circumcision instrument. The least painful circumcisions were performed by using a Mogen clamp and DPNB, as more than half of all infants circumcised with this method did not cry at all. We hope that the performance of circumcisions without anesthesia will no longer be condoned or considered acceptable in either a clinical or investigational setting.

It is likely that the popularity of circumcision will increase or decrease every few years based on prevailing medical opinions as to its benefits or lack thereof. It is also likely that despite changing trends it will continue to be performed on a significant percentage of newborn infants. It is therefore imperative that if it is going to be performed that it be performed in a manner that causes the infant as little pain as possible. We feel that unless another method is proven to be as effective, DPNB should be used for all circumcisions. Other ancillary methods of circumcision pain control continue to be investigated. As mentioned earlier, they include dipping pacifiers in sucrose solution, various forms of swaddling, topical anesthetics, and others. It is crucial to remember, however, that none of these have been proven to be as effective as DPNB, and at the present time should be considered for use in addition to, and not in place of, DPNB.

In summary, we have shown that using the Mogen clamp after a DPNB will minimize or even eliminate the pain of neonatal circumcision. We believe that it is incumbent upon those performing circumcisions as well as on those who establish national policies and guidelines to acknowledge the pain and distress associated with this procedure. It is therefore imperative that methods of pain control with proven safety and efficacy become the standard of care for all neonatal circumcisions.

**REFERENCES**


A Comparison of the Mogen and Gomco Clamps in Combination With Dorsal Penile Nerve Block in Minimizing the Pain of Neonatal Circumcision
Peter S. Kurtis, Hema N. DeSilva, Bruce A. Bernstein, Lillian Malakh and Neil L. Schechter

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