Original Article

Improving pain score and restraint duration during circumcision

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Abstract

The American Academy of Pediatrics (AAP) recommends providing adequate analgesia during circumcision. Ring block is the most effective method of analgesia, while topical crème (EMLA: lidocaine and prilocaine topical) alone is ineffective. We conducted a quality improvement (QI) project. The aim was to reduce pain scores and restraint duration during circumcision by 20% from baseline over six months. **Methods:** We followed the standard QI process using PDSA cycles and standard QI charts. **Results:** Our preintervention data over six weeks revealed significantly higher pain scores if residents performed the procedure or if EMLA was used compared to nerve block. Our intervention included but was not limited to having a new policy to stop using EMLA and have residents watch a video on ring block before performing the procedure. Data collected over subsequent 3.5 months showed that the mean restraint time was reduced by 29% by attendings and by 15% by residents, the use of EMLA cream was eliminated, mean pain score was reduced by 82% when performed by residents and by 20% by attendings, and pain score above 3 was reduced by 100% by residents and attendings. We conducted a sustainability phase over two months. We demonstrated the sustainability of reduced restraint time among attendings but to a lesser extent among residents and the sustainability of mean pain score among both. **Conclusions:** We conclude that improving effective analgesia during circumcision can be achieved and sustained using the QI project.

Keywords: Circumcision, neonate, pain, restraint, ring block

Background/Introduction

Circumcision of newborn boys is the most frequently performed procedure globally.[1] The American Academy of Pediatrics (AAP) supports infant male circumcision (MC) as a desirable public health measure.[2] Early infant MC confers immediate and lifelong benefits.[3,4] The AAP recommends that adequate analgesia should be provided whenever newborn circumcision is performed.[2] Ring block is the most effective method of analgesia, while a topical cream (lidocaine 2.5% and prilocaine 2.5%; EMLA; Aspen, UK) alone is not effective.[3,4]

Circumcision is a painful procedure and requires restraining the infant during the procedure. Inadequate analgesia during the procedure is associated with pain and possible long-term effects.[4]

Our hospital is a community hospital with 1800 deliveries yearly. Circumcision is a commonly performed procedure. It is usually performed by obstetric or family practice attendings and residents. It was noticed that infants are restrained for long periods, and the procedure was associated with excessive crying.

There are no published quality improvement (QI) projects to reduce pain during circumcision. Because of its universal importance, we conducted this QI project using a standard QI process to reduce pain during circumcision.

Aim

To reduce pain score of more than 3 and restraint duration during circumcision by 20% from baseline, over six months.

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Procedure and Measurement

We followed the standard QI process using PDSA cycles and standard QI charts. We collected data on each circumcision procedure performed from August 6, 2021 to September 20, 2021. In addition to basic demographic data, we focused on the duration of the restraint time and the pain score when using the foreskin clamp. Because effective anesthesia may require a longer time, and shorter restraint duration may affect the performance of effective anesthesia, we used the pain score and the restrain duration as an outcome and balancing measure. We used the modified NIPS score, since it is the most commonly used in the literature, a reliable and validated scoring system,[4] and our nurses are trained to score pain in babies. We scored pain during circumcision at the point when the foreskin is clamped. The use of one point during the circumcision to score pain was simple and feasible. The pain score during foreskin clamp application was lower when either ring or dorsal nerve block was used than EMLA alone.[3,4]

Our preintervention data over six weeks as shown in Table 1 revealed significantly higher pain scores if the residents performed the procedure or if EMLA was used compared to a dorsal or ring nerve block. Also, restraint duration was almost three times longer if residents performed the procedure than attending physicians.

Design

Our interventions included the elimination of the use of EMLA cream since it was ineffective and replacing it with a ring or dorsal nerve block in addition to non-pharmacological measures such as using a pacifier with sucrose and containment.[4] We had a team composed of the medical director of obstetrics, the program director of family medicine, residents, and nurses who met and discussed the problem, obstacles, and possible interventions. We used a key driver, fishbone analysis, and Pareto chart to understand the preintervention data. The Pareto chart revealed that 80% of the causes of pain score more than 3 (signifying pain[3]) was the use of EMLA cream alone and if the procedure is performed by residents instead of attendings as well as if performed when last feed was more than 3 hours indicating hungry babies [Figure 1]. There was one obstetrician with a high number of patients who uses EMLA alone. We discussed the literature and our findings with him and our plan to change the policy to replace the use of EMLA cream with a ring or dorsal nerve block. He was receptive, and we changed the policy. We also communicated with the residency program director. We required residents to read the clinical practice guidelines (CPG) we created on circumcision and watch a video on circumcision using dorsal and ring blocks before they could do circumcisions. There were

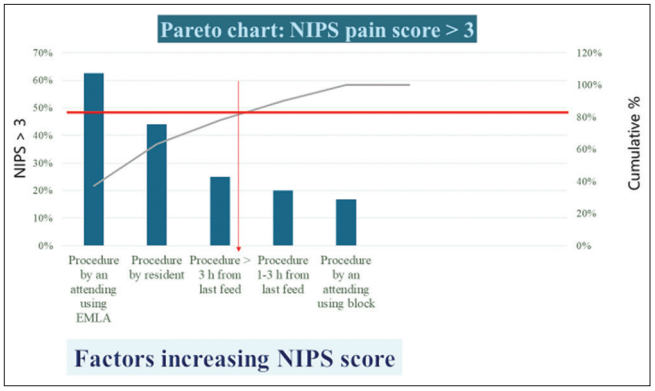

Figure 1: Factors increasing NIPS score > 3 (Pareto chart)

Table 1: Data Summary PDSA-2

PDSA-2 Data Summary: 8/6/21 – 9/20/21

35 Circumcisions	%
By attendings	74%
By residents	26%
Nerve Block	77%
EMLA (one OB)	23%

Performed by	NIPS score (mean)	(median)
Attendings	1.0 ± 2.4	0
Residents	3.8 ± 2.8	3
EMLA-attending	3.9 ± 2.9	4.5

Restrain time	Minutes
Attendings	11 ± 10
Residents	27 ± 12

NIPS score > 3	%
EMLA	63%
Nerve block (resident)	44%
Nerve block (attending)	17%

no available reliable videos on circumcision with anesthesia on the internet. We created two videos on the procedure and made them available on YouTube with code access.[5] We also presented the preintervention data to the executive hospital administration to support policy change. We also educated nurses on the importance of pain control during the procedure. We encouraged nurses to voice concerns if the baby is in pain and ensure that the infant is tested for effective analgesia before attempting the painful steps of the procedure. We planned to celebrate success and include residents, attendings, and nurses in the celebration to help sustain improvements.

Strategy

Our initial PDSA-1 cycle revealed longer restrain duration if residents perform circumcision compared to attendings. The pain score data were not accurate as there was inconsistency in the nurse's scoring points. Some scored as instructed during the foreskin clamping, and others scored maximum pain during the procedure. Therefore, we reeducated the nurses on accurate scoring and data collection. PDSA-2 was then started. We considered PDSA-2 data as our pre-intervention data, as described earlier. PDSA-3 was post-intervention. Subsequently, without further interventions, we ran a sustainability PDSA-4 cycle six months after PDSA-3.

Results

Post-intervention data (PDSA-3): Data collected from March 14 to July 17, 2022 (3.5 months) showed that mean restraint time was reduced by 29% by attendings (from 14 to 10 minutes) and by 15% by residents (from 27 to 23 minutes), the use of EMLA cream was eliminated (from 16% to 0%), mean pain score was reduced by 82% when performed by residents (from 3.8 to 0.7) and by 20% by attendings (from 1.0 to 0.8), and the pain score above 3 was reduced by 100% by residents and attendings (from 44% to 17%, respectively, to 0%) [Table 2 and Figure 2]. Almost in all infants, sucrose with a pacifier was used. The circumcision was performed using the Gomco, but occasionally, a plastic bell was used.

Sustainability data (PDSA-4): Data collected from January 30 to March 28, 2023 (2 months) demonstrated sustainability of reduced restraint time among attendings (10.3 ± 7.5 minutes) but to a lesser extent among residents (27.1 ± 12.7 minutes) and sustainability of mean pain score among both [Table 3 and Figure 3].

Our balancing measure of restraint time was not increased by reducing pain using effective analgesia. On the contrary, it decreased.

One possible improvement could be the timing of the procedure. When performed within one hour of feeding, infants can be calmer than when hungry. The consent process can be improved with added description and emphasis on analgesia. A family-centered approach where parents are included in the process, with consideration of allowing them to be around during the procedure.

Lessons and Limitations

We learned to identify inaccurate or incomplete data collection as early as possible (PDSA-1). Maintain momentum, overcome

Table 2: Data Summary PDSA-3

PDSA-3 Data Summary: 3/14/2022 to 7/17/2022

35 Circumcisions	%
By attendings (79)	76%
By residents (25)	24%
Nerve Block	100%
EMLA (one OB)	0%

Performed by	NIPS score (mean)	(median)
Attendings	0.8 ± 0.9	0
Residents	0.7 ± 1.0	0

Restrain time	Minutes
Attendings	10 ± 5.4
Residents	23 ± 6.5

NIPS score > 3	%
Nerve block (resident)	0%
Nerve block (attending)	0%

Table 3: Sustainability Data Summary

Sustainability data summary : PDSA-4 : 01/30/23 – 02/28/23

69 Circumcisions	%
By attendings: 56	81.5%
By residents: 13	18.5%
Nerve or ring Block	100%
EMLA (one OB)	0%

Performed by	NIPS score (mean)	(median)
Attendings	0.7 ± 1.0	0
Residents	0.6 ± 1.3	0

Restrain time	Minutes
Attendings	10.3 ± 7.5
Residents	27.1 ± 12.7

NIPS score > 3	%
Residents	8%
Attendings	0%

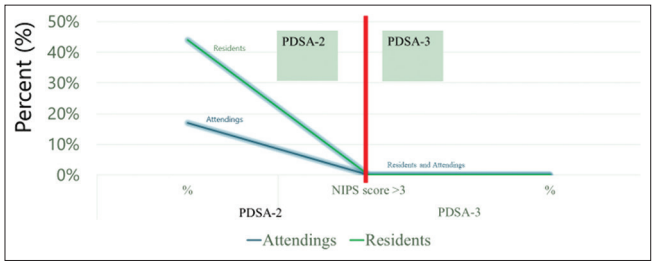

Figure 2: NIPS score > 3 (PDSA-2 vs PDSA-3; comparing attendings and residents)

challenges, such as training residents, and provide educational material, such as clinical practice guidelines and videos. Buy-in is critical through involving multiple teams and getting them engaged, such as obstetricians, family practice attendings, residents, nurses, and administration. Communication is key, especially to change ineffective practices, such as the use of EMLA cream by one of the obstetricians. Also, include policy change as appropriate to assure compliance with the change and involve executive leadership for support. Sustaining success is challenging but achievable.

Limitations

One limitation was the need to train new residents, which takes time and thus makes it more difficult to sustain restraint duration reduction. However, this did not affect the sustainability of reducing pain when residents perform circumcision.

We plan to continue to have residents follow instructions of reviewing the CPG on circumcision, watch the videos and watch the procedure twice before starting to do it.

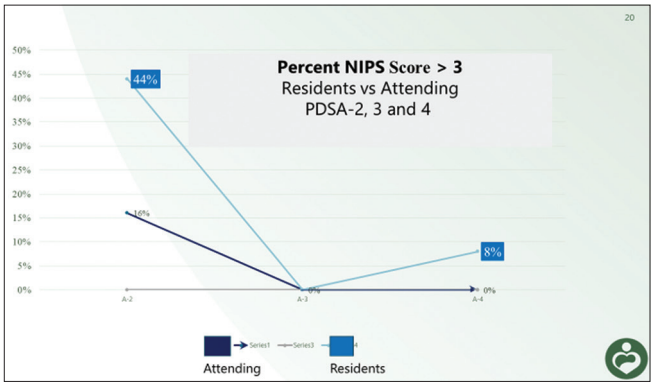

Figure 3: NIPS Score > 3 (Residents vs Attending; PDSA-2, PDSA-3, and PDSA-4)

Discussion

Male circumcision is a painful procedure and it is frequently performed with inappropriate analgesia methods. The combination of ring block and sensorial saturation during male circumcision is superior to other approaches.[2-4] The implementation of proper analgesia practices during circumcision is still lacking. There are no published QI projects on improving the implementation of proper analgesia during male circumcision. Our work is the first QI project to demonstrate that reducing pain during male circumcision is achievable using a standard QI process and is also sustainable. This provides a model for other centers to improve the practice of using proper analgesia during the procedure.

The procedure is performed by different specialties and varies in different centers and regions of the world, which includes pediatric surgeons, obstetricians, pediatricians, family practice, and primary

care physicians. In many regions of the world, primary care and family practice physicians are the most available to patients. It is expected that more primary care and family physicians will do the procedure as it is common and requires minimal skills. This work provides a QI process to reduce pain during circumcision.

Conclusion

Providing adequate analgesia during newborn circumcision is a standard of care.[2,4] Often, the analgesia used is ineffective. Inadequate training, especially when the procedure is performed by residents in training, was a common cause of ineffective analgesia. Practitioners that use ineffective methods, such as EMLA cream without nerve block, are another cause of ineffective analgesia. Empowering families and nurses to be advocates for pain control during the procedure can be helpful. Engagement of all involved, such as practitioners, nurses, parents, and administration, is essential for success. Creating CPG and changing policies is required. Overcoming obstacles through brainstorming, data analysis, and feedback is essential.

We conclude that improvement in the provision of effective analgesia during circumcision can be achieved and sustained using the QI project.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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