TEMPERATURE MEASUREMENT OF NEONATES FOLLOWING CIRCUMCISION

A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF MASTER OF SCIENCE

IN THE GRADUATE SCHOOL OF THE

TEXAS WOMAN'S UNIVERSITY

COLLEGE OF NURSING

BY

JANET E. BAHR, R.N., B.S.N.

DENTON, TEXAS

MAY 1978

The Graduate School

Texas Woman's University

Denton, Texas

April 12 1978

We hereby recommend that the Thesis prepared under our supervision by Janet E. Bahr entitled "Temperature Measurement of Neonates Following Circumcision"

be accepted as fulfilling this part of the requirements for the Degree of Master of Science.

Committee:

[illegible]
Chairman

[illegible]

[illegible]

Accepted:

Phyllis Bridges
Dean of The Graduate School

ACKNOWLEDGEMENTS

My sincere thanks go to the friends, committee members, family, and research participants who helped in the thesis endeavor.

In particular, I would like to thank the following persons: Donna Kem, R.N., C.N.M., M.S.N. for her encouragement and guidance throughout the writing of the thesis; Dawn Bruce, R.N., M.S.N., and Rosalyn Martin, R.N, M.S.N., for their help and assistance which they gave during the writing of the thesis; and Joan Reisch, Ph.D., for her consultation in statistics.

A special thanks are due to my family who have supported me in my educational endeavors.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

CHAPTER I

INTRODUCTION

Parents today are questioning the routine circumcision of their male infants. Circumcision, an ancient surgical procedure, has been documented as early as 4000 B.C. A Biblical passage (Genesis 17:10) instructed Abraham to circumcise every male. This practice has continued for both medical and religious reasons. The latest vital statistics on circumcision in the United States, indicated that between sixty and ninety-seven percent of males were circumcised (Klauber 1973).

Advantages and disadvantages of circumcision have been discussed for a number of years. The advantages of circumcision focus on hygiene; prevention of cervical, penile, and prostatic cancer; and prophylaxis against phimosis, balanoposthitis, and venereal disease. Disadvantages of circumcision include medical complications arising from circumcision, the infliction of unnecessary trauma to the neonate, and a potential decrease in sexual sensation of an unprotected glans penis in the adult male. Another argument against circumcision centers on the newborn not having a choice in the matter.

Stress has been described as a nonspecific response of the body to any demand made upon it (Selye 1956). A stress state can be produced by a variety of different environmental conditions. A stress reaction affects certain internal organs particularly the adrenals, thymus, and gastrointestinal tract (Selye 1956). Studies have shown that increased adrenal cortical hormones and disturbances of sleep-wake states were a part of the stress response of the neonate following circumcision (Anders and Chalemian 1974, Emde et al. 1971, and Talbert et al. 1976).

One parameter that has not been thoroughly studied is the effect of circumcision on body temperature in the neonate immediately following the procedure. Temperature is one physical measurement that indicates homeostasis of body functioning. Stressors disrupt homeostasis which lead to changes in physiological functioning of the body.

From the foregoing discussion, it is reasonable that the stress imposed by circumcision would be partially reflected in a change of temperature following the procedure. The purpose of this study is to determine the effect of circumcision on temperature of the neonate in order to enable nurses to better understand the stress response of the neonate following circumcision so that appropriate nursing care can be implemented.

Statement of Problem

The problem investigated in this study was to determine whether there is a change in body temperature in the neonate immediately following circumcision.

Statement of Purposes

The purposes of this study were:

1. To determine body temperature readings immediately before circumcision of the neonate
2. To determine body temperature readings immediately after circumcision of the neonate
3. To compare body temperature readings immediately before and after circumcision of the neonate
4. To determine the relationship of weight, age in hours, type of circumcision, and length of the procedure to any temperature changes in the neonate following circumcision

Background and Significance

In 1971 and 1975 the Committee on Fetus and Newborn of the American Academy of Pediatrics (Report of the Ad Hoc Task Force on Circumcision 1975, p. 611) stated that "there is no absolute medical indication for routine circumcision of the newborn." However, despite this report, the rate of neonatal circumcisions has remained high. The incidence of routine circumcision in North America has been estimated to be between sixty and ninety-seven percent and increasing (Klauber 1973).

Circumcision, one of the oldest and most common surgical procedures performed in our society (Bolande 1969), has religious, social, and cultural value among many races and cultures. The history of circumcision dates back as far as 4000 B.C. when Egyptians practiced this custom. The Bible alluded to circumcision in Genesis 17:10 in which God instructed Abraham to circumcise every male. Circumcision continues to be performed in the Jewish and Moslem religions as a ritualistic religious custom.

Neonatal circumcision is performed almost routinely by Christians in America, but without religious connotations. The procedure is usually based on medical concepts that it prevents phimosis, paraphimosis, balanoposthitis, venereal disease, and carcinoma of the penis in later life (Bolande 1969, Klauber 1973, and Preston 1970).

Prevention of phimosis is one of the most common reasons for advocating circumcision. However, it has been known for many years that only 4 percent of newborns have fully retractable foreskins. At one year, 50 percent of normal males have retractable foreskins and it is not until the age of three that 90 percent of males have fully retractable foreskins (Gairdner 1949).

Balanitis, a painful inflammation of the glans penis is very rare in circumcised men, occuring almost exclusively in the uncircumcised male as a result of poor hygiene (Eiger 1972). The relationship between circumcision and the incidence of venereal disease has not been adequately studied (Report of the Ad Hoc Task Force on Circumcision 1975). Adequate genital hygiene appears to be an important factor in the prevention of phimosis, paraphimosis, balonoposthitis, penile carcinoma, and venereal disease in the uncircumcised male (Preston 1970).

Although rare in the United States (0.5 percent of all malignant conditions), penile carcinoma is almost always found in uncircumcised males (Leiter and Lefkovits 1975). Very few cases of cancer of the penis in circumcised males have been reported in the literature. In the cases reported, an irritative factor appeared to be associated with the development of the lesion. Poor penile hygiene, venereal disease, and phimosis have been stressed as causative factors in cancer of the penis. Racial predisposition to the disease may be another factor. Although Leiter and Lefkovits (1975, p. 1521) concluded "that circumcision at birth virtually guarantees immunity from penile carcinoma in later life," there is also evidence that optimal hygiene offers nearly as much protection. In

Sweden, where the standards of personal hygiene are high, cancer of the penis is almost unknown, although circumcision is not practiced (Klauber 1973). Thus, the relationship between circumcision and penile carcinoma remains unknown (Report of the Ad Hoc Task Force on Circumcision 1975).

At the present time there are no conclusive studies indicating that lack of circumcision is the primary etiologic factor in development of cervical cancer in women. Studies reported by Aitken-Swan and Baird (1965), Boyd and Doll (1964), and Terris et al. (1973), have not demonstrated a statistically significant difference among groups of women with cancer as compared to control groups in regard to circumcision status of the mate.

Circumcision, like all surgical procedures, carries with it certain risks and complications. The immediate complications of circumcision are hemorrhage, infection, and trauma (Gallagher 1972, Gee and Ansell 1976, and Report of the Ad Hoc Task Force on Circumcision 1975). The most frequent delayed complication is meatal ulceration leading to meatal stenosis caused by irritation of the glans penis by ammoniacal urine trapped in diapers (Klauber 1973).

Immediate physiological effects of circumcision are confined mainly to stress responses in the neonate. Studies have been reported that measured neonate's response to stressors by determining the level of adrenocortical steroids circulating in the blood plasma. Anders et al. (1970) found a marked increase in plasma cortisol in the human neonate after 20 minutes of crying, as opposed to the other behavioral states of quiet wakefulness, and sleep states of rapid-eye movement (REM) and non-rapid-eye movement (NREM). Tennes and Carter (1973) found that plasma cortisol was most closely correlated with behavioral state. In this study, no systematic relationship was found between cortisol level and sex, birthweight, birthweight for gestational age, recency of circumcision, or Apgar scores. Talbert et al. (1976) studied neonates circumcised in the first 6 hours of life to determine the stress response reflected in the increased amount of adrenal cortical hormones. They found increased levels of both cortisol and cortisone at 20 minutes and 40 minutes after circumcision, which indicated the response to the stress of circumcision of the hypothalmic-pituitary-adrenal axis during the first 6 hours of life (Talbert et al. 1976).

Studies have also been reported that determined the effects of circumcision on the sleep-wake states in neonates. Emde et al. (1971) reported increased quiet sleep periods during the 10 hours following routine neonatal circumcision. However, Anders and Chalemian (1974) found a significant increase in wakefulness during the first hour following routine circumcision of the neonate. Later quiet sleep state shifts as described by Emde et al. (1971) are probably secondary to the immediate changes in wakefulness described by Anders and Chalemian (1974).

The previous studies measuring stress responses in the neonate following circumcision (Anders and Chalemian 1974, Emde et al. 1971, and Talbert et al. 1976) have not compared the type of circumcision to the stress response in the neonate. The two most common types of circumcision procedures are the Gomco circumcision clamp and the Plastibell device (Trier and Drach 1973). The amount of stress produced by circumcision may be different depending on the type of circumcision procedure. Also the length of the procedure may influence the stress response in the neonate.

According to Selye (1976), stress interferes with the regulation of body temperature. Emotional stress often leads to increased body temperature. Physical stress can result in either an increase or decrease in body temperature, depending on the nature of the stressor. Few researchers have precisely studied body temperature as an indicator of the stress response.

Assessment of body temperature is important in determining the neonate's health status. Body temperature is a measurement of the difference between heat produced and heat lost from the body. According to Guyton (1976, p. 961), body temperature is regulated through a temperature regulating center located in the hypothalmus. However, the thermoregulating mechanism is not fully developed at birth (Reeder et al. 1976, p. 400), and the neonate's temperature does not begin to stabilize until 12 to 24 hours after birth. The age of the neonate influences it's ability to maintain heat balance and stabilize temperature and is a variable considered when determining temperature changes following circumcision.

Williams and Lancaster (1976) discussed three mechanisms by which the rate of heat produced by the body can be increased. These are (1) voluntary muscle activity, (2) shivering, and (3) chemical or nonshivering thermogenesis. Although neonates change positions to accommodate for environmental temperature changes, the last means is the primary mechanism for neonates to increase the rate of heat produced, as neonates very rarely shiver. Nonshivering, or chemical thermogenesis, involves the use of brown fat to increase the metabolic rate and produce the needed heat (Williams and Lancaster 1976). Neonates also possess the ability to conserve body heat by vasoconstriction (Clark and Affonso 1976, p. 702, and Pillitteri 1976, p. 219).

There are four major routes by which body heat is transferred between the neonate and the environment. These routes are evaporation, radiation, conduction, and convection (Lutz and Perlstein 1971, and Williams and Lancaster 1976). Neonates are particularly vulnerable to temperature changes in the environment due to the thin layer of subcutaneous fat and the larger surface area in relation to body mass (Eoff et al. 1974, and Williams and Lancaster 1976). Maintaining a warm environment conserves the neonate's energy and improves his/her chances of survival.

A recommendation of the American Academy of Pediatrics is that neonates under two and one-half kilograms should not be circumcised (Klauber 1973). The weight of the neonate influences the amount of subcutaneous fat and body surface area in relation to body mass present in the neonate. According to Korones (1976, p. 65), smaller neonates have a larger surface area which increases heat loss due to a greater exposure to the environment. Small neonates also have less subcutaneous fat and are poorly insulated, therefore they lose core body heat to the skin more readily than larger neonates. Korones (1976) concluded that smaller infants have greater thermal losses to the environment. Therefore, the weight of the neonate may influence the amount of temperature change following circumcision.

The two most common sites for temperature measurement in the neonate are the axilla and the rectum. The rectal temperature has been considered the most accurate method of temperature assessment. However, comparisons of rectal and axillary temperatures of neonates have shown minimal differences (Eoff et al. 1974, and Lutz and Perlstein 1971).

Assessment of temperature in the neonate can be safely and accurately measured by the axillary route. Axillary temperature measurement on the neonate reduces the risk of perforation of the rectum due to insertion of a rectal thermometer, and it does not stimulate the urge to defecate (Eoff et al. 1974). Lutz and Perlstein (1971, p. 20) stated that "whether temperatures are measured in the rectum or axilla is less important than the consistent measuring of temperatures at the same site with the same thermometer." In controlled environments such as the nursery, it is recommended that axillary temperatures be taken on all neonates (Blainey 1974 and Eoff et al. 1974).

Pillitteri (1976, p. 264) suggested that electronic thermometers are ideal to use with neonates because the speed of recording makes manipulation of the neonate minimal. The electronic thermometer also records temperature to the one-tenth of a degree whereas glass thermometers record temperature to within two-tenths of a degree.

Studies of circumcision have mainly focused on the incidence of penile and prostatic cancer in circumcised and uncircumcised subjects and physiological stress reactions of the body measuring adrenocortical steroid levels and sleep-wake states. Of clinical significance to nurses is maintaining adequate warmth for the neonate during the circumcision procedure. Verhonick and Nichols (1968, p. 43) stated that "the important cardinal signs should be examined as a measurement in terms of nursing practice and should be appraised for criterion measures in research in nursing." They asked the question, "What are some of the patterns that cardinal signs present in relation to the patient's condition. . .?" This study attempted to determine the relationship of circumcision to one cardinal sign--temperature.

Hypotheses

In this study, the following hypotheses were tested:

1. There will be no difference in axillary

temperature taken in the neonate immediately before and at 5 minutes and 15 minutes after circumcision

2. There will be no relationship between (a) weight, (b) age in hours, (c) type of circumcision, and (d) length of the procedure to temperature changes in the neonate following circumcision

Definition of Terms

For the purposes of this study, the following definition of terms were utilized:

1. Circumcision--the surgical removal of the prepuce (foreskin), the loose cap-like skin that covers the glans or head of the penis

2. Gomco circumcision--the use of a sterile metal surgical device in which the foreskin is stretched over a metal bell, excess foreskin excised, and the metal bell device removed

3. Plastibell circumcision--a plastic cone or bell device which is fitted over the glans. The foreskin is stretched over the bell and a ligature applied just above the bell. The distal foreskin is then excised and the cone removed. The plastic ring is left in place to cause tissue necrosis and will be sloughed off in 5 to 7 days

4. Neonate--a newborn infant from birth to 4 weeks of age. For the purposes of this study, only neonates less than 72 hours of age were used

5. Term neonate--a neonate between 38 to 42 weeks gestational age. For the purposes of this study, the gestational age was determined by the obstetrician's calculated estimated date of confinement of the mother

6. Full-term nursery--the nursery that houses healthy term neonates after their initial stay in an admission nursery

7. Body temperature--a measurement of the difference between heat produced and heat lost from the body. For the purposes of this study temperature was measured by the axillary route

Limitations

1. The circumcisions were done by various individuals. The skill of the practitioner may have influenced the stress response in the neonate

2. The study was confined to neonatal circumcisions

3. There may have been a discrepancy between the obstetrician's calculated estimated date of confinement and the actual gestational age of the neonate

4. The room temperature may have influenced the amount of temperature change in the neonate

5. The study was performed in one institution therefore it cannot be generalized to the population as a whole

Delimitations

The following delimitations were identified in this study:

1. Only healthy neonates from one full-term nursery were chosen as subjects

2. Only neonates born by vaginal delivery without complications of pregnancy, labor, or delivery were chosen as subjects

3. The neonates' age range was from 24 hours after birth to 72 hours after birth

4. The neonates' weight was above 2500 grams or 5 and 1/2 pounds

5. The neonates' gestational age was between 38 and 42 weeks gestation as determined by the obstetrician's calculated estimated date of confinement of the mother

6. Neonates of all races were included in the sample as was convenient

Assumptions

This study was based on the following assumptions:

1. Circumcision produces physiological stress to the body

2. Stress inflicted upon the body manifests itself in many ways. Stress produces changes in the cardinal signs of temperature, pulse, and respiration

3. Temperature measurement is one means of determining homeostasis of body functioning

Summary

This chapter has included a discussion of the problem and purposes of the research study, and has provided supportive background information regarding the problem. Included in the chapter was the statement of hypotheses, definition of terms, limitations, delimitations, and assumptions for the research study.

Chapter II, Review of Literature, discusses the history of circumcision, advantages and disadvantages of circumcision, and stress related to circumcision. This chapter also includes a discussion of temperature measurement in the neonate. Chapter III, Procedure for Collection and Treatment of Data, explains the method of data collection and the treatment of this data for the purposes of the study. Chapter IV, Analysis of Data, describes the statistical analysis of the data obtained. Chapter V, Summary, Conclusions, Implications, and Recommendations, discusses the results of the study and illustrates examples of appropriate application of them.

CHAPTER II

REVIEW OF LITERATURE

This research study was conducted for the purpose of determining body temperature of the neonate immediately before and after circumcision and comparing these readings for differences, as well as determining the relationship of weight, age in hours, type of circumcision, and length of the procedure to temperature changes in the neonate following circumcision. This chapter, Review of Literature, presents the historical aspects of circumcision, advantages and disadvantages of circumcision, complications of circumcision, physiological effects (stress responses) following circumcision, the relationship between stress and temperature changes, and body temperature measurement in neonates.

Historical Review of Circumcision

Circumcision is one of the oldest and most common surgical procedures performed in our society (Bolande 1969 and Speert 1953). It has religious, social, and cultural value among many races and cultures. The exact history of circumcision is practically unknown. Evidence found on bas-relief plaques in Egypt date the operation back to 2400 B.C. (Hand 1950, Ozturk 1973, and Wrana 1939). These plaques show actual pictures of the operation. However, archeologists believe the custom existed much before 2400 B.C., possibly as early as 4000 B.C. (Ozturk 1973 and Wrana 1939).

In ancient Egypt captured warriors were marked as slaves by being circumcised. Later descendents of these slaves were also circumcised. The Jews who were largely slaves, adopted the practice of circumcision after Abraham established a blood covenant with God through circumcision, and it became a ritualistic religious custom (Burger and Guthrie 1974). According to Jewish religion, Abraham made a "blood covenant" with God by being circumcised so that the seed of the Jews would be preserved and spread throughout the nations (Hand 1950 and Wrana 1939). From that point on all of the descendants of Abraham were circumcised. Infants of Jewish parents are routinely circumcised by a mohel (a religiously ordained circumciser) on the eighth day of life (Carbary 1975). In the Moslem religion circumcision is also practiced but it is not performed until the age of twelve as a rite of puberty (Burger and Guthrie 1974).

Circumcision is practiced throughout the world on every continent from Alaska to the South Sea Islands (Speert 1953 and Wrana 1939). It is estimated that most of the world population practices circumcision. Circumcision is performed for hygienic reasons, for religious reasons, and for cultural and tribal customs. In many cultures circumcision is a puberty rite to ensure fertility. In other cultures, it also serves as a bodily sacrifice to the deity. Other explanations for this custom in various cultures are a means of identification or "tribal mark", a symbol of having become a full grown man, a bodily ornament and an assurance of reincarnation (Hand 1950 and Wrana 1939).

Neonatal circumcision is performed almost routinely by Christians in America, but without religious and cultural connotations. It is estimated that over 90 percent of American male neonates are circumcised (Carbary 1973). Circumcision is thought to have a positive hygienic value in American society as well as to prevent the medical complications of phimosis, paraphimosis, venereal disease, and carcinoma of the penis in later life (Bolande 1969, Klauber 1973, and Preston 1970).

Advantages and Disadvantages of Circumcision

In the last twenty years there has been an abundance of articles in the medical literature discussing the advantages and disadvantages of routine neonatal circumcision. Some physicians as well as some parents are beginning to question the routine circumcision of male neonates.

One of the reasons that circumcision in the neonate has been advocated is to prevent phimosis. Phimosis is the adherance of the foreskin to the glans penis making retraction of the foreskin impossible. Gairdner (1949) found that only 4 percent of neonates have fully retractable foreskins. At one year, 50 percent of normal males had retractable foreskins, and it was not until the age of three that 90 percent of males had fully retractable foreskins. What appears to be phimosis in the neonate is actually persistance of prepucial adhesions which are caused by normal histological development at this age. To diagnose phimosis, the prepucial opening must be so narrow as to obstruct the flow of urine, causing ballooning of the prepuce with urination (Klauber 1973 and Preston 1970). According to Klauber, (1973) phimosis in the neonate does not exist, therefore, phimosis of the neonate is not a valid medical indication for a circumcision (Report of the Ad Hoc Task Force on Circumcision 1975).

Another condition that is prevented by circumcision is balanitis. Balanitis is a painful infection of the glans penis which occurs very infrequently in circumcised males (Eiger 1972). Poor penile hygiene appears to precipitate the balanitis.

It has also been speculated that there is a relationship between venereal disease and the lack of circumcision, however this has not been adequately studied to date (Report of the Ad Hoc Task Force on Circumcision 1975). Taylor and Rodin (1975) found that there was a relationship between genital Herpes simplex virus infection and the absence of circumcision. Morgan (1965) has observed that

> Venereal disease is most prevalent in the lower socioeconomic groups, the same groups in which the vast majority of uncircumcised males are to be found. Tuberculosis, like the foreskin, is also most commonly found in the lower socioeconomic groups. We must be excused for doubting that to have a prepuce is to enhance liability to tuberculosis. *Post hoc ergo propter hoc* is invalid logic (p. 311).

Preston (1970) concluded that adequate genital hygiene appeared to be a decisive factor in the prevention of phimosis, paraphimosis, balonoposthitis, penile carcinoma, and venereal disease in the uncircumcised male. Penile hygiene is facilitated by a properly performed circumcision. If circumcision is not elected, the male child needs to be taught proper genital hygiene. Careful retracting of the foreskin to cleanse smegma from the glans penis is necessary as smegma can harbor bacteria, urine, and viruses which cause odor, itching and infections. Preston (1970, p. 1857) equated genital hygiene to other personal hygiene habits by stating "if a child can be taught to tie his shoes or brush his teeth or wash behind his ears, he can also be taught to wash beneath his foreskin." In areas and climates where personal hygiene is not adequate, circumcision probably decreases incidence of complications related to poor hygiene. An important factor in evaluation of the contention that routine circumcision may prevent more problems than it creates is the practice of personal hygiene (Gallagher, 1972).

The prevention of penile carcinoma in later life is another reason for advocating circumcision in the neonate. Penile carcinoma, a rare disease in the United States, (0.5 percent of all malignant conditions) almost always occurs in uncircumcised males (Leiter and Lefkovits 1975). There have been very few cases of cancer of the penis in Jewish and non-Jewish males circumcised at birth reported in the literature since 1936. This data indicated that circumcision performed in the neonatal period is a reliable preventive measure against the development of carcinoma of the penis. In countries where circumcision is delayed until later years, such as the Mohammedans of India, the rate of penile cancer is increased (Speert 1953).

Irritative factors such as poor penile hygiene, venereal disease, and phimosis appeared to be associated with the development of penile carcinoma; racial predisposition may be another factor in cancer development. In the United States the incidence of cancer of the penis is approximately four times higher in blacks than in whites (Leiter and Lefkovits 1975).

Opponents of routine circumcision refute that neonatal circumcision virtually guarantees immunity from penile cancer in later life, with the argument that optimal hygiene offers nearly as much protection. Carcinoma of the penis is very uncommon in Sweden where standards of hygiene are high and circumcision is not practiced (Klauber 1973 and Preston 1970).

There remains controversy over performing circumcisions as prophylaxis against such a rare disease as cancer of the penis. Marshall in 1954 made a bold statement that continues to be quoted in the literature today. He said:

> If a surgeon would perform one circumcision every ten minutes, eight hours a day, and five days a week, he would seem able to prevent one penile cancer by working steadily for between 6 and 29 years (p. 790).

Cancer of the prostate is a more common disease in American men than cancer of the penis. However, the relationship between circumcision and prostatic carcinoma remains unknown (Report of the Ad Hoc Task Force on Circumcision 1975). Ravich (1965) reported the incidence of prostatic carcinoma to be higher in uncircumcised subjects, whereas Apt (1965) reported the incidence of this disease higher in circumcised subjects. However, the data are inconclusive as both studies had errors of ommission of significant information.

Studies of the relationship between circumcision and cervical cancer in women are inconclusive at the present time. Aitken-Swan and Baird (1965) found complete circumcision to be as freqent in husbands of patients with cancer as in husbands of controls. Boyd and Doll (1964) also reported no difference in the rate of cervical cancer among non-Jewish women whose marital partners were not circumcised and non-Jewish women whose husbands were circumcised. In a study by Terris et al. (1973) no statistically significant difference was demonstrated among patients with invasive carcinoma of the cervix, carcinoma _in situ_, or cervical dysplasia compared to a control group in regard to circumcision status of the mate.

They concluded (p. 1065) that "the role of circumcision in the epidemiology of cancer of the cervix remains uncertain."

Complications of Circumcision

The immediate risks and complications of circumcision are hemorrhage, infection, and trauma (Gallagher 1972, Gee and Ansell 1976, and Report of the Ad Hoc Task Force on Circumcision 1975). Hemorrhage is the most frequent complication followed by infection. Infection occurs more often following Plastibell than Gomco circumcisions. Trauma includes laceration of the penile and scrotal skin, surgical bivalving the glans penis, cautery burns, dehiscence, urethral fistula, and circumcision of unrecognized hypospadias (Gee and Ansell 1976 and Klauber 1973).

Meatal ulceration, leading to meatal stenosis, caused by irritation of the glans penis by ammoniacal urine trapped in diapers is the most frequent delayed complication of circumcision (Klauber 1973). Klauber (1973) indicated the incidence of meatal stenosis to be three to five percent. He further indicated (p. 447) that "meatal stenosis does not occur in the uncircumcised because the foreskin was designed to protect the glans penis from the effects of ammoniacal urine." Other delayed complications include (1) urinary retention (Berman 1975, Frand et al. 1974, and Horwitz 1976), (2) concealed penis (Talarico and Jasaitis 1973 and Trier and Drach 1973), (3) retained Plastibell rings (Datta and Zinner 1977), and preputial skin-bridging (Klauber and Boyle 1974).

Contraindications for circumcision include prematurity, low Apgar score, neonatal illness, congenital anomaly of the genitals (especially hypospadias) and evidence of blood dyscrasias. Circumcisions prior to 24 hours after birth are not recommended (Burger and Guthrie 1974 and Report of the Ad Hoc Task Force on Circumcision 1975).

Physiological Effects - Stress Response

Anders et al. (1970) measured the stress response of neonates by determining the level of adrenocortical steroids circulating in the blood plasma. They found a marked increase in plasma cortisol in 19 out of 20 experiments after the neonates had been crying for 20 minutes. This was significant at the $p < .001$ level. The other behavioral states of quiet wakefulness, sleep state of non-rapid-eye movement (NREM) and rapid-eye movement (REM) which were studied showed no statistically significant increase in cortisol levels. Tennes and Carter (1973) also studied plasma cortisol levels and behavioral states during early infancy. In their study of 40 full-term infants they found (p. 128) that "low cortisol levels were. . .associated with the sleep state and high levels with a period of fussiness or crying. . . ." In this study, no systematic relationship was found between cortisol level and sex, birthweight, birthweight for gestational age, recency of circumcision, or Apgar scores.

Talbert et al. (1976) studied neonates circumcised in the first 6 hours of life to determine the amount of adrenal cortical hormone released into the blood stream as a result of the physical stress of circumcision. Five normal newborn male infants delivered vaginally were selected for the study. The method of circumcision was Gomco. A blood sample was obtained prior to circumcision and 20 minutes and 40 minutes after circumcision. They found increases of both cortisol and cortisone at 20 minutes and 40 minutes after circumcision. The increase in cortisol achieved statistical significance whereas cortisone was increased but not significantly. These results indicated the responsiveness of the hypothalmic-pituitary-adrenal axis to the stress of circumcision during the first 6 hours of life (Talbert et al. 1976).

Anders and Chalemian (1974) and Emde et al. (1971) have studied the effects of circumcision on the sleep-wake states in neonates. Emde et al. (1971) reported that circumcision was usually followed by prolonged non-REM sleep. The effects of circumcision were demonstrable with an increase in the amount of non-REM sleep ($p < 0.01$) and a decrease in latency to the onset of non-REM sleep ($p < 0.05$) during the 10 hours after circumcision. The authors concluded that this selective priority of quiet sleep was manifestation of the stress response to circumcision. In the study by Anders and Chalemian (1974), no significant changes in the active REM or quiet NREM sleep states were demonstrated. However, they did find an immediate and significant increase in wakefulness during the hour following routine circumcision of the neonate. The results of these two studies indicated that later quiet sleep state shifts as described by Emde et al. (1971) were probably secondary to the immediate changes in wakefulness described by Anders and Chalemian (1974). The results may also mean that neonates exert little control over sleep state proportions.

The previously cited studies measuring stress responses in the neonate following circumcision have not compared the type of circumcision to the stress response in the neonate. This variable may be of significance in interpreting data measuring stress responses in neonates.

The amount of stress produced by circumcision may be different depending on the type of circumcision procedure, as well as the length of the procedure may also influence the stress response in the neonate.

The two most common types of circumcision procedures are the Gomco circumcision clamp and the Plastibell device (Trier and Drach 1973). The Gomco circumcision clamp is a sterile metal surgical device in which the foreskin is stretched over a metal bell, excess foreskin is excised, and the metal bell device removed. This is an acute surgical procedure lasting approximately 10 to 15 minutes. The Plastibell device is a plastic cone or bell device which is fitted over the glans penis. The foreskin is stretched over the bell and a ligature applied just above the bell. The distal foreskin is then excised and the cone removed. This procedure also lasts approximately 10 to 15 minutes. The plastic ring is left in place to cause tissue necrosis and will be sloughed off in 5 to 7 days.

Stress and Temperature Regulation

Selye (1976) indicated that stress interfers with the regulation of body temperature. One form of stress, emotional stress, often leads to increased body temperature. Body temperature can be increased or decreased by physical stress. Animal studies have indicated an increase in body temperature of rats following bilateral fracture of the femur. This increase was evident within the first day post fracture (Hardy et al. 1970, p. 749). This study indicated a relationship between stress and body temperature.

Body Temperature in Neonates

One means of determining a neonate's health status is by assessing body temperature. Body temperature is regulated by a temperature regulating center located in the hypothalmus (Guyton 1976, p. 961). However, the neonate's thermoregulating mechanism is not fully developed at birth (Reeder et al. 1976, p. 400), thus making the neonate susceptible to subtle temperature changes within the first 12 to 24 hours of life or until the temperature begins to stabilize. Therefore, the age of the neonate influences his/her ability to maintain heat balance and stabilize temperature and is a variable to note when measuring temperature changes following circumcision.

Body temperature is the measurement of the difference between heat produced and heat lost from the body. According to Williams and Lancaster (1976) the rate of heat produced (thermogenesis) by the body can be increased through three mechanisms. These are (1) voluntary muscle activity, (2) shivering, and (3) chemical or nonshivering thermogenesis. Each of these mechanisms cause heat to be produced by increasing the metabolic rate (Korones 1976, p. 66). The neonate when exposed to cold stress, may change positions to accommodate for environmental temperature changes. However, this form of voluntary muscle activity does not produce significant heat for the neonate (Korones 1976, p. 66). The neonate rarely shivers, so this form of heat production is not significant in neonatal thermogenesis. Thus the major form of neonatal thermogenesis is chemical or nonshivering thermogenesis which involves the use of brown fat to increase the metabolic rate and produce the needed heat (Williams and Lancaster 1976). Neonates can also conserve body heat by vasoconstriction (Clark and Affonso 1976, p. 702, and Pillitteri 1976, p. 219).

Nonshivering or chemical thermogenesis requires increased oxygen consumption to accelerate chemical reactions that break down brown fat. Brown fat is a type of adipose tissue, comprising 2 to 6 percent of the neonate's body weight, which has unusual thermogenic activity. Brown fat is located between the scapulae, around the muscles and blood vessels of the neck, in the axilla, behind the sternum, and around the kidneys and adrenals (Korones 1976, p. 67). During periods of cold stress norepinephrine is released from sympathetic nerve endings which are bountiful in brown fat. The norepinephrine stimulates the break down of brown fat into glycerol and nonesterified fatty acids (Williams and Lancaster 1976). The by-product of this increased chemical activity is an increased amount of heat produced by the neonate. This is the primary means by which neonates compensate for heat loss.

The four major routes by which body heat is transferred between the neonate and the environment are (1) evaporation, (2) radiation, (3) conduction, and (4) convection (Korones 1976, p. 65; Lutz and Perlstein 1971; and Williams and Lancaster 1976). Evaporative heat loss occurs when there is conversion of a liquid into a vapor. Heat may be lost from the body surface by evaporation at delivery and during the bathing of neonates. Radiant heat transfer occurs when heat is transferred from a warm object to a cooler object not in direct contact with each other such as radiant warmers. Conduction is the transfer of heat from a warm object to a cooler object through direct contact. Cold diapers and cold weighing scales are examples of heat loss through conduction. Convection is the transfer of heat between a body and the surrounding air. Air conditioning and administration of cold oxygen to neonates contributes to heat loss through convection. All of the previous routes of heat transfer except evaporation can cause either an increase or decrease in the neonate's temperature (Korones 1976, Lutz and Perlstein 1971, and Williams and Lancaster 1976).

Neonates are particularly vulnerable to temperature changes in the environment due to the thin layer of subcutaneous fat and the larger surface area in relation to body mass (Eoff et al. 1974 and Williams and Lancaster 1976). The weight of the neonate determines the amount of subcutaneous fat and body surface area present in relation to body mass. The American Academy of Pediatrics recommends that neonates under two and one-half kilograms should not be circumcised (Klauber 1973). According to Korones (1976, p. 65), smaller neonates have a larger surface area which increases heat loss due to a greater exposure to the environment. Small neonates also have less subcutaneous fat and are poorly insulated therefore they lose core body heat to the skin more readily than larger neonates. Korones (1976, p. 66) concluded that "the smaller the infant, the greater are the thermal losses to the environment." Therefore, the weight of the neonate may influence the amount of temperature change following circumcision.

Measurement of Temperature

Temperature of the neonate is usually assessed by axillary or rectal measurement. The rectal temperature has been considered the most accurate method of temperature assessment. However, a research study by Eoff et al. (1974) showed minimal differences between axillary and rectal temperatures of neonates.

Average rectal and axillary temperature readings of neonates differ from study to study. Lutz and Perlstein (1971) found rectal temperatures in neonates to be between 96.0° to 99.5°F. According to the research study by Eoff et al. (1974), they found the range of rectal temperatures to be 97.2° to 99.8°F. They also found the range of axillary temperatures in the same neonates to be 96.0° to 99.4°F. Pillitteri (1976, p. 389) suggested that axillary temperatures should be maintained at 97.8°F.

The use of rectal temperature measurement in the neonate has several disadvantages. The use of the rectal thermometer involves risk. Insertion of a thermometer more than two or three centimeters into the neonate's anus can perforate the rectum or colon (Eoff et al. 1974). Other disadvantages of the rectal temperature measurement identified by Blainey (1974) included, (1) placement of the thermometer at different sites within the rectum produces different temperature readings, (2) replication of thermometer placement is difficult, (3) the presence of stool may interfere with placement of the thermometer against the wall of the rectum, and (4) changes in the heart rate due to rectal temperature measurement are increased.

Temperature in the neonate can be safely and accurately measured by the axillary route. Axillary temperature measurement in neonates has two advantages over rectal measurements. Axillary temperature measurement of the neonate does not involve risk of perforation of the rectum or colon due to insertion of a rectal thermometer, and axillary measurement does not stimulate the urge to defecate (Eoff et al. 1974). Lutz and Perlstein (1971, p. 20) stated that "whether temperatures are measured in the rectum or axilla is less important than the consistent measuring of temperatures at the same site with the same thermometer." In controlled environments such as the nursery, it is recommended that axillary temperatures be taken on all neonates (Blainey 1974 and Eoff et al. 1974).

Pillitteri (1976,p. 264) suggested that electronic thermometers are ideal to use with neonates because of the speed of recording makes manipulation of the infant minimal. The electronic thermometer also records temperatures to the one-tenth of a degree whereas glass thermometers record temperatures to within two-tenths of a degree farenheit. Eoff et al. (1974) compared axillary and rectal temperatures using a glass thermometer and an electronic telethermometer. They found that telethermometers registered a wider range of temperatures of both rectal and axillary routes. They also found a significant difference between axillary and rectal temperatures measured with a glass thermometer but not with a telethermometer.

Summary

A review of the literature has shown that studies of circumcision have mainly focused on incidences of penile and prostatic cancer in circumcised and uncircumcised subjects and incidences of cervical cancer in mates of circumcised and uncircumcised subjects. Documentation in the literature indicated that neonates responded to the stress of circumcision by increasing the amount of corticosteroids in the plasma and by exhibiting a disturbance of the sleep-wake state.

Animal studies have indicated that stress can cause an increase in body temperature. One parameter that has not been thoroughly studied is the effect of circumcision on body temperature of the neonate immediately following the procedure.

The next chapter, Procedure for Collection and Treatment of Data, explains the method of data collection and the treatment of the data for the purposes of the study.

CHAPTER III

PROCEDURE FOR COLLECTION AND TREATMENT OF DATA

This research study was an experimental study conducted for the purpose of determining whether there was a change in axillary temperature of neonates following circumcision. This chapter, Procedure for Collection and Treatment of Data, discusses the setting and population of the study, and the methods used in collecting and analyzing data.

Setting

The setting for this study was a full-term nursery located within a large metropolitan hospital in the Midwest. The bed capacity is approximately 600 with a 20-bed maternity unit. The average number of deliveries per month approximates 93, with a daily full-term nursery census averaging 10-12 neonates. There are approximately 48.5 percent male neonates and 51.5 percent female neonates.

There are two full-term nurseries, one admission nursery, and one large high-risk nursery. Each full-term nursery has a bed capacity of 12 neonates.

The majority of circumcisions are performed between 8 A.M. and 12 noon, in an examination area located between the nursery and the nurses' station. The area is located directly adjacent to the nursery and is connected to the nursery by a sliding glass window. The environmental temperature where the circumcisions are performed, is consistent with the nursery temperature of 75-78°F. and was maintained at this temperature throughout the study.

Neonates are usually circumcised on the second or third day of life by the obstetrician or a resident. The two methods of circumcision used at this hospital are the Gomco clamp device and the Plastibell device.

Population

The target population of this study was composed 30 male neonates who met the predetermined criteria: (1) only healthy neonates from one full-term nursery were included in the study, (2) only neonates born by vaginal delivery without complications of pregnancy, labor, or delivery were included in the study, (3) the neonates were between 24 hours to 72 hours of age, (4) the neonates' weight was above 2500 grams or 5 pounds 8 ounces, (5) the neonates' gestational age was between 38 and 42 weeks, and (6) all races were included in the study.

The thirty male neonates were selected by convenience sampling for subjects in the study. The data were collected between November 1977 and March 1978.

Consent for including each neonate in the study was obtained from the mother after verbal explanations of the research study (See Appendix A). The mother was told the purpose and method of data collection for the study. It was then explained that no names would be used in the study, that there were no risks involved and that she could withdraw from the study at any time if she so chose. After an opportunity to ask questions, the mother was then asked if her neonate could be included in the study. If she agreed, she signed the consent form (See Appendix A). The verbal explanations and signatures were witnessed by a third person.

Tool Used

An electronic thermometer was used to measure axillary temperatures. This tool was selected based on reports in the literature that electronic thermometers registered a wider range of temperatures than the standard glass thermometer, and that there was no significant difference between axillary and rectal temperatures measured with an electronic thermometer (Eoff et al. 1974).

The electronic thermometer facilitates ease and rapidity of collecting data and the calibration is in smaller units of measurement than the standard glass thermometer (Pillitteri 1976). The same electronic thermometer was used throughout the study.

The Pilot Study

Three male neonates were selected by convenience sampling to be used in a pilot study. The purposes of the pilot study were: (1) to make improvements in the research project, and (2) to detect problems that must be corrected before the major study was attempted (Treece and Treece 1973).

Permission was obtained from the mother for including each neonate in the study prior to the circumcision. Within 5 minutes prior to circumcision an axillary temperature was taken under each arm with an electronic thermometer. The electronic thermometer probe was left under the axilla until the machine indicated that the maximum temperature had been obtained.

The neonate was then placed on the circumcision board with a diaper under his buttocks and legs. The undershirt remained on the neonate and a folded blanket was placed across the chest of the neonate. A sterile drape was placed over the abdomen and lower extremities with a hole in the center from which the penis protruded. The circumcision procedure was then begun. At 5 minutes and 15 minutes after the circumcision was completed, temperature readings were again taken under each axilla with the electronic thermometer. An attempt was made to place the thermometer probe in exactly the same place for all temperature measurements on each neonate. Three times during the pilot study repeated temperature measurements were taken after circumcision: one immediately following the other. This did not result in any discrepancy of readings. Weight, age in hours, type of circumcision, length of the procedure, temperature of the environment, and gestational age were recorded for each neonate.

The temperature readings obtained under each axilla were compared. The results of the pilot study indicated that it made no difference as to what axilla was used to measure the temperature as the temperature readings were the same under each axilla. The right axilla was thus chosen for temperature measurement throughout the study.

At one time during the pilot study, a neonate was prepared for circumcision but was delayed for 30 minutes. An axillary temperature measurement was taken at 5-minute intervals until the circumcision procedure was started. The temperature did not vary at all during the first five measurements but did decrease 0.1°F. on the last measurement before circumcision.

There were no procedural changes in the research design as a result of the pilot study.

Method of Data Collection

A list of neonates who were candidates for circumcision was obtained from the nursing personnel each day that data were collected between November 1977 and March 1978. These neonates were screened to determine whether they met the criteria for the study. Consent was obtained from the mother as explained on page 41.

Within 5 minutes prior to circumcision, an axillary temperature was taken under the right axilla with an electronic thermometer. This temperature and the time it was taken was recorded on the data sheet by the investigator (See Appendix B). The neonate was then placed on a circumcision restraining board and the penis scrubbed with betadine-saturated cotton balls, in preparation for circumcision. A diaper was placed under the neonate, the undershirt remained on the neonate, and a folded blanket was placed across the chest of the neonate in an attempt to not expose the neonate unnecessarily. A sterile drape was placed over the abdomen and lower extremities with a hole in the center from which the penis protruded.

The circumcision was then performed by the obstetrician or resident. The time the circumcision began and ended was recorded on the data sheet (See Appendix B).

At 5 minutes and 15 minutes after the circumcision temperature readings were obtained under the right axilla using an electronic thermometer. The same electronic thermometer was used throughout the study. An attempt was made to place the thermometer probe in the same exact location each time a temperature reading was taken on a neonate. The same watch was used to time the events of the study during the entire time the data were collected.

Other demographic data collected on each neonate included: (1) weight, (2) hours of age, (3) type of circumcision, (4) length of the procedure, (5) estimated date of confinement, (6) gestational age calculated from the estimated date of confinement, (7) temperature of the environment, and (8) Apgar scores at 1 and 5 minutes (See Appendix B). Each of the neonates were screened for prenatal, labor, and delivery complications (See Appendix B).

All data were collected by one investigator.

Procedure for the Analysis of Data

Once the data were obtained, the results were tabulated and evaluated. The data were then treated in the following ways. Frequency distributions were presented for each of the demographic variables. Summary statistics were provided for temperatures before circumcision, 5 minutes after circumcision, and 15 minutes after circumcision, as well as the demographic variables of weight, age in hours, type of circumcision, and length of the procedure. The repeated measures analysis of variance test (Winer 1971) with Duncan's multiple range test (Duncan 1955) was used to test the hypotheses.

For comparative purposes the neonates were divided into two weight groups. Temperatures of neonates larger than 7½ pounds were compared to temperatures of neonates smaller than 7½ pounds. Temperature of neonates 24-48 hours and 48-72 hours of age were compared to determine whether any differences existed. Data were compared to determine differences in temperature following circumcisions with the Gomco and Plastibell devices. The temperature of neonates on whom the procedure lasted less than 10 minutes was also compared to those lasting more than 10 minutes.

Summary

In this chapter, the setting was described as a full-term nursery in one metropolitan hospital in the Midwest. Selection of the sample was made from male neonates by convenience sampling.

Temperatures were taken under the right axilla using an electronic thermometer, 5 minutes prior to circumcision, 5 minutes after circumcision, and 15 minutes after circumcision. Data were collected on thirty male neonates.

The method for the analysis of the data was then discussed. The statistical method chosen was the repeated measures analysis of variance with Duncan's multiple range test.

Chapter IV, Analysis of Data, will present the summary statistics and will discuss the statistical analysis of the data obtained.

CHAPTER IV

ANALYSIS OF DATA

An experimental research study was conducted for the purposes of determining body temperature readings immediately before and immediately after circumcision, comparing body temperature readings immediately before and immediately after circumcision to determine whether differences existed, and determining the relationship of the demographic variables of weight, age in hours, type of circumcision, and length of the procedure to temperature changes in the neonate following circumcision. Temperature readings were collected on thirty male neonates before circumcision and at 5 minutes and 15 minutes following circumcision. This chapter, Analysis of Data, will present the analysis and interpretation of the data.

Presentation and Analysis of Data

Description of the Sample

The sample was composed of thirty healthy full-term male neonates between 38-42 weeks gestational age, weighing above 2500 grams (5½ pounds), and between 24 to 72 hours of age who were undergoing the circumcision procedure.

Tables 1 through 8 summarize the demographic variables. The weight distribution of the sample is shown in Table 1; it demonstrates that a greater number of neonates were $7\frac{1}{2}$ pounds or above. The mean weight was 7.4 pounds with a standard deviation of 0.85 pounds (See Appendix C for complete demographic variables).

TABLE 1

WEIGHT DISTRIBUTION OF THE SAMPLE

Weight Groups	Number of Neonates	Percentage of Sample
Less than $7\frac{1}{2}$ pounds	13	43
More than $7\frac{1}{2}$ pounds	17	57

N = 30

The age distribution of the sample is summarized in table 2 which shows that one-half of the neonates were 24-48 hours of age and one-half of the neonates were 48-72 hours of age. The mean age of the sample was 45.89 hours with a standard deviation of 14.47 hours (See Appendix C for complete demographic variables).

Table 3 summarizes the type of circumcision procedure of the sample. More neonates were circumcised with the Plastibell procedure than the Gomco procedure.

TABLE 2

AGE DISTRIBUTION OF THE SAMPLE

Age Groups	Number of Neonates	Percentage of Sample
24-48 hours	15	50
48-72 hours	15	50

N = 30

TABLE 3

TYPE OF CIRCUMCISION OF THE SAMPLE

Type of Circumcision	Number of Neonates	Percentage of Sample
Plastibell	21	70
Gomco	9	30

N = 30

A summary of the length of the procedure of the sample is presented in table 4. It demonstrates that almost as many procedures lasted less than 10 minutes than more than 10 minutes. The average length of the procedure was 10.7 minutes with a standard deviation of 6.02 minutes (See Appendix C for complete demographic data).

TABLE 4

LENGTH OF CIRCUMCISION OF THE SAMPLE

Length of Procedure	Number of Neonates	Percentage of Sample
Less than 10 minutes	14	47
More than 10 minutes	16	53

N = 30

Table 5 shows the mean, standard deviation, and range of the demographic variables of weight, age in hours, and length of the procedure.

TABLE 5

SUMMARY STATISTICS ON DEMOGRAPHIC VARIABLES BASED ON AN N = 30

Variables	Mean	Standard Deviation	Range
Weight	7.4	0.85	5 pounds 8 ounces to 8 pounds 12 cunces
Age in Hours	45.89	14.47	24 hours 13 minutes to 71 hours
Length of Procedure	10.76	6.02	3 minutes to 33 minutes

Some other demographic data were collected on the sample. Table 6 shows the gestational age distribution. The mean gestational age was 40 weeks with a range of 38 to 42 weeks and a standard deviation of 1.08 (See Appendix D for complete data on gestational age).

TABLE 6

DISTRIBUTION OF GESTATIONAL AGE OF SAMPLE

Gestational Age Groups	Number of Neonates	Percentage of Sample
38 to 39 weeks	3	10
39 to 40 weeks	9	30
40 to 41 weeks	8	27
41 to 42 weeks	8	27
42 weeks	2	6

N = 30

The distribution of one minute and five minute Apgar scores is displayed in table 7. The mean one minute Apgar score was 8.3 and the mean five minute Apgar score was 9.6 with a standard deviation of 0.59 and 0.49 respectively. The range of one minute Apgar scores was 7 to 9 and the range of five minute Apgar scores was 9 to 10.

TABLE 7

APGAR SCORES OF THE SAMPLE

Apgar Score	One Minute	Percentage	Five Minutes	Percentage
7	2	6	0	0
8	17	57	0	0
9	11	37	12	40
10	0	0	18	60

N = 30

Table 8 shows the distribution of room temperature when the circumcision procedure was performed on each subject. The mean temperature of the environment was 76.8°F. with a standard deviation of 0.74 and a range of 76°F. to 78°F. (See Appendix D for complete data on room temperature.

TABLE 8

ROOM TEMPERATURE OF THE SAMPLE

Temperature	Number of Neonates	Percentage of Sample
76°F.	11	37
77°F.	13	43
78°F.	6	20

N = 30

Comparisons of Temperature Readings
Before and After Circumcision

To test hypothesis 1, the repeated measures analysis of variance test (Winer 1971) with Duncan's multiple range test (Duncan 1955) was used to analyze the data. The repeated measures analysis of variance test is a statistical procedure used to compare means when repeated measurements are taken on the same subjects at various intervals.

The null hypothesis stated that there would be no difference in axillary temperatures taken in the neonate immediately before and at 5 and 15 minutes after circumcision and the alternative hypothesis would be stated that there would be a difference in axillary temperatures taken in the neonate immediately before and at 5 and 15 minutes after circumcision. Table 9 shows the mean temperatures before circumcision, and at 5 minutes and 15 minutes after circumcision of the entire sample of 30 neonates (See Appendix E for complete data on temperature before and after circumcision).

TABLE 9

MEAN TEMPERATURE BEFORE AND AFTER CIRCUMCISION

Time of Temperature Measurement	Mean Temperature
Before Circumcision	97.74°F.
5 Minutes After Circumcision	97.86°F.
15 Minutes After Circumcision	97.88°F.

An overall difference was found using the repeated measures analysis of variance test. Duncan's multiple range test was utilized to find which pairs were different from one another. The temperature before circumcision was significantly different from both temperatures taken after circumcision ($p < .05$); however, the temperatures taken after circumcision were not significantly different from one another. Table 10 summarizes this data.

TABLE 10

SIGNIFICANCE OF TEMPERATURE TAKEN BEFORE AND AFTER CIRCUMCISION

Time of Circumcision	Critical Values for Studentized Range	Sample Values for Studentized Range	Significance
Before vs 5 minutes after Circumcision	3.01	3.36	$p < .05$
Before vs 15 minutes after Circumcision	2.86	2.95	$p < .05$
15 minutes after vs 5 minutes after Circumcision	2.86	.41	N.S.

Utilizing the repeated measures analysis of variance test and Duncan's multiple range test at the $\alpha = 0.05$ level, the null hypothesis 1 was rejected in favor of the alternative hypothesis. It was concluded that there was an increase in axillary temperatures at 5 minutes and 15 minutes after circumcision compared to the temperature reading taken immediately prior to circumcision.

Comparisons of Demographic Variables of Weight, Age in Hours, Type of Circumcision, and Length of the Procedure

To test hypothesis 2, the repeated measures analysis ov variance test was again used. Hypothesis 2 stated that there would be no relationship between (a) weight, (b) age in hours, (c) type of circumcision, and (d) length of the procedure to temperature changes in the neonate following circumcision. The mean temperature by weight group at each measurement interval is summarized in table 11. The two weight groups were (1) less than 7½ pounds and (2) more than 7½ pounds.

In order to obtain a significant difference for both weight and temperature, the sample had to have probability values less than or equal to 0.05. The F values along with the sample probability values for weight groups and temperature are shown in table 12. The analysis of variance showed that

TABLE 11

MEAN TEMPERATURE BY WEIGHT GROUPS

Weight Groups	Temperature Before Circumcision	Temperature 5 Minutes After Circumcision	Temperature 15 Minutes After Circumcision
Less than $7\frac{1}{2}$ pounds	97.59	97.70	97.80
More than $7\frac{1}{2}$ pounds	97.85	97.98	97.94

there was no significant difference in the interaction between weight and temperature ($p > .05$) and no significant difference ($p > .05$) in weight groups. As discussed before there was a significant difference ($p < 0.05$) in the replicated temperature measurements before circumcision and at 5 minutes and 15 minutes after circumcision.

TABLE 12

F VALUES AND SIGNIFICANCE LEVELS OF WEIGHT AND TEMPERATURE

Variables	F Value	Sample p Value
Weight groups	1.28	0.26
Temperature Replicates	3.53	0.03
Interaction between weight and temperature	0.93	0.40

Table 13 summarizes the mean temperature by age groups at each time interval. The age groups were (1) 24-48 hours of age, and (2) 48-72 hours of age.

TABLE 13

MEAN TEMPERATURE BY AGE GROUPS

Age Groups	Temperature Before Circumcision	Temperature 5 Minutes After Circumcision	Temperature 15 Minutes After Circumcision
24-48 hours	97.85	97.91	97.92
48-72 hours	97.63	97.81	97.83

The repeated measures analysis of variance test showed no significant difference ($p > .05$) between age groups. The interaction between age group and repeated temperature measurements showed no significant difference ($p > .05$) which leads one to the conclusion that age and temperature are independent of each other. Table 14 shows the F values and sample probability values for age groups and temperature.

The mean temperature by type of circumcision is summarized in table 15. The two types of circumcision groups are (1) Gomco and (2) Plastibell.

TABLE 14

F VALUES AND SIGNIFICANCE LEVELS OF AGE AND TEMPERATURE

Variables	F Value	Sample p Value
Age Groups	1.73	0.50
Temperature Replicates	3.17	0.04
Interaction between age and temperature	1.30	0.39

TABLE 15

MEAN TEMPERATURE BY TYPE OF CIRCUMCISION

Type of Circumcision	Temperature Before Circumcision	Temperature 5 Minutes After Circumcision	Temperature 15 Minutes After Circumcision
Gomco	97.85	98.04	98.06
Plastibell	97.70	97.79	97.80

The analysis of variance showed no significant difference ($p > .05$) in the interaction between type of circumcision and repeated temperature measurements and no significant difference ($p > .05$) between the type of circumcision groups. Table 16 shows the F values and sample probability values for type of circumcision and temperature.

TABLE 16

F VALUES AND SIGNIFICANCE LEVELS OF TYPE OF CIRCUMCISION AND TEMPERATURE

Variables	F Value	Sample p Value
Type of Circumcision Group	1.08	0.31
Temperature Replicates	3.71	0.03
Interaction Between Type of Circumcision and Temperature	0.43	0.64

Table 17 summarizes the mean temperature by length of the procedure groups at each time interval. The length of procedure groups were (1) less than 10 minutes, and (2) more than 10 minutes.

TABLE 17

MEAN TEMPERATURE BY LENGTH OF PROCEDURE GROUPS

Length of Procedure Groups	Temperature Before Circumcision	Temperature 5 Minutes After Circumcision	Temperature 15 Minutes After Circumcision
Less than 10 Minutes	97.92	98.02	97.96
More than 10 Minutes	97.59	97.73	97.81

The repeated measures analysis of variance showed no significant interaction ($p > .05$) between length of procedure and repeated temperature measurements. The analysis of variance also showed no significant difference ($p > .05$) between the length of procedure groups. Table 18 demonstrates the F values and sample probability values for length of procedure and temperature.

TABLE 18

F VALUES AND SIGNIFICANCE LEVELS
OF LENGTH OF PROCEDURE
AND TEMPERATURE

Variables	F Value	Sample p Value
Length of Procedure groups	0.46	0.19
Temperature Replicates	3.35	0.04
Interaction between Length of Procedure and Temperature	0.94	0.28

Based on the repeated measures analysis of variance test for each of the variables of (a) weight, (b) age in hours, (c) type of circumcision, and (d) length of procedure, the null hypothesis 2 was accepted. There was no relationship between each of the variables and temperature changes in the neonate following circumcision. The results were similar for each of the demographic variables. The variable (weight, age, etc.) and temperature were factors independent of each other. However, in each instance there were differences in temperature taken prior to circumcision when compared to temperatures taken after circumcision for each of the demographic variable groups.

Summary of Findings

In this study it was determined that there was a significant difference at the $p < .05$ level between axillary temperatures taken immediately before circumcision and axillary temperatures taken at 5 minutes and 15 minutes after circumcision of neonates. However, there was no significant difference between the 5 minute and 15 minute temperatures. The temperature measurements taken after circumcision showed a significant increase in temperature compared to the temperature measurements taken before circumcision.

When the variables of weight, age in hours, type of circumcision, and length of the procedure were analyzed taking temperature changes in the neonate into account, no significant differences were demonstrated. This indicated the independence of the demographic variable and the temperature variable. However, the repeated temperatures showed significant differences between the temperature before circumcision and the temperatures after circumcision in each of the demographic variable groups.

Summary

In this chapter, Analysis of Data, the analysis and interpretation of the collected data were discussed. The analysis of the collected data was summarized and interpreted through tables and discussion.

Chapter V, Summary, Conclusions, Implications, and Recommendations will summarize the research study, draw conclusions from the data, make implications to nursing, and make recommendations for further study.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Summary

An experimental research study was conducted for the purposes of (1) determining body temperature readings immediately before circumcision of the neonate, (2) determining body temperature readings immediately after circumcision of the neonate, (3) comparing body temperature readings immediately before and after circumcision of the neonate, and (4) determining the relationship of weight, age in hours, type of circumcision, and length of the procedure to temperature changes in the neonate following circumcision.

Data were collected on thirty healthy full-term male neonates. The study criteria of the sample were: (1) only healthy neonates from one full-term nursery were included in the study, (2) only neonates born by vaginal delivery without complications of pregnancy, labor, or delivery were included in the study, (3) the neonates were between 24 to 72 hours of age, (4) the neonates' weight was above 2500 grams or 5 pounds 8 ounces, (5) the neonates' gestational age was between 38 and 42 weeks, and (6) all races were included in the study.

Axillary temperature readings were taken with an electronic thermometer and recorded on each subject within 5 minutes prior to circumcision, 5 minutes after circumcision, and 15 minutes after circumcision. The demographic variables of weight, age in hours, type of circumcision, and length of the procedure were recorded on the data sheet for each subject. Other demographic data of gestational age, temperature of the room, and one minute and five minute Apgar scores were also recorded for each subject.

The demographic variables were divided into 2 groups each. Temperature of neonates larger than 7½ pounds were compared to temperatures of neonates smaller than 7½ pounds. Temperature of neonates 24-48 hours and 48-72 hours of age were compared to determine whether any differences existed. The Gomco circumcision procedure group was compared to the Plastibell circumcision procedure group to determine differences in temperature. The temperature of neonates on whom the procedure lasted less than 10 minutes was also compared to those lasting more than 10 minutes.

Statistical analysis of the collected data was then conducted by utilizing the repeated measures analysis of variance test and Duncan's multiple range test. The data were presented in summary tables.

In this study it was determined that there was a significant difference ($p < .05$) in the temperature taken before circumcision when compared to the temperature taken at 5 minutes and 15 minutes after circumcision. The two temperatures taken after circumcision were not significantly different from one another.

When the variables of weight, age in hours, type of circumcision, and length of procedure were compared to the temperature variables, no significant difference was found between the groups. There was no significant interaction or relationship between the demographic variables and the temperature variable. Each variable was independent of each other. However, in the analysis of variance between the groups of demographic variables, it was found that the repeated temperature measurements were significantly different from the first temperature measurement in each instance.

Conclusions

This study concludes that there is a significant increase in temperature following circumcision, but that there is no significant relationship between weight, age in hours, type of circumcision, and length of procedure and temperature changes following circumcision. However, no matter what group is considered, there is a difference in temperature taken after circumcision when compared to temperature taken before circumcision. The groups of demographic variables do not determine the difference.

Although there was a statistically significant increase in temperature following circumcision, the actual increase in tenths of a degree was very small. The normal range of axillary temperature discussed by Eoff et al. (1974) was 96.0°F. to 99.4°F. The range of axillary temperatures in this study was 96.3°F. to 98.8°F. (See Appendix E). Even with the increase of temperature following circumcision the actual temperature stayed within a clinical range of normal.

Based on the findings of this study, one can conclude that neonates do not become cold stressed during circumcision when the room temperature remains consistent with the nursery temperature. The increase in temperature following a stressful event such as circumcision, indicates that temperature measurement can be utilized as an indicator of stress reactions in research studies.

Implications

One implication for nursing practice is that a slight increase in temperature following circumcision is not unusual. If this increase in temperature is a direct result of the stress of circumcision, the neonate may need special soothing measures to counteract the stress. After circumcision the nurse can explain to parents that the neonate may need extra cuddling and soothing. The nurse must also understand that circumcision is a stressful event for the neonate and that if the neonate is experiencing multiple stressors she may want to discuss with the physician the possibility of delaying the circumcision until a later date.

Nurses should also understand that with temperature control of the environment and making the circumcision conditions as near the thermal situation that the neonate is accustomed to in the nursery, that cold stress will not occur.

Implications for nursing education include teaching the broad concept of stress in every nursing program curriculum. Specific stress reactions can be discussed as a student encounters each clinical component of nursing such as a discussion of the stress of circumcision in an obstetric clinical conference group. Teaching nurses and nursing students about ways to decrease stress are also important.

Discussions of clinical research using physiological responses has implications for both nursing education and nursing research. Temperature changes are one physiological parameter that can be studied under various clinical conditions. Another implication for nursing research is the dissemination of the findings of this study in nursing literature.

Recommendations

Based on the findings of the study, the following recommendations have been made:

1. Conduct further studies of temperature as an indicator of the stress response

2. Studies be conducted utilizing matched pairs to determine if the increase in temperature is due to the stress of circumcision or the stress of being restrained

3. Research studies be done comparing axillary and rectal temperatures before and after circumcision

4. Further studies be conducted measuring other physiological changes associated with stress such as heart rate, respiratory rate, and adrenocortical steroid levels before and after circumcision

5. A study be conducted in which the noxious stimulus of circumcision be counteracted with a positive stimulus such as rubbing the head or sucking on a pacifier and the temperature be measured before and after circumcision

APPENDIX A

ORAL EXPLANATION OF RESEARCH STUDY
TO MOTHER OF NEONATE

1. I am Janet Bahr, a graduate nursing student at Texas Woman's University, Dallas, Texas. In partial fulfillment of the requirements for a Master's of Science Degree, I am conducting a research study measuring body temperature immediately after circumcision in the newborn.

2. The purpose of the study is to determine if there is a change in body temperature after circumcision of the newborn. I will be taking an axillary (under the arm) temperature with an electronic thermometer immediately before and at 5 minutes and 15 minutes after circumcision. The data will then be analyzed to determine if there has been a change in temperature. The results of this study will be helpful to nurses in understanding the effects of circumcision in relation to body temperature.

3. There is no risk involved as this is the same procedure used normally to determine your baby's temperature in the nursery.

4. I understand that your baby is going to be circumcised today and I would like to include your baby in my study. In order to carry out my study, I need written consent from a parent to include your baby in the study. Neither your name, nor your baby's name will be identified in the study in any way, and you are free to withdraw from the study at any time.

5. Do you have any questions about the study that I could clarify?

6. The findings of the study, should you be interested in the results, will be abailable at Texas Woman's University, Dallas Center.

7. Thank you for your assistance.

TEXAS WOMAN'S UNIVERSITY

(Form B--Oral presentation to subject)

Consent to Act as a Subject for Research and Investigation:

I have received an oral description of this study, including a fair explanation of the procedures and their purpose, any associated discomforts or risks, and a description of the possible benefits. An offer has been made to me to answer all questions about the study. I understand that my name will not be used in any release of the data and that I am free to withdraw at any time.

Subject is a minor (age__________)

Signatures (one required):

Mother	Date
Father	Date
Guardian	Date
Witness	Date

Certification by Person Explaining the Study:

This is to certify that I have fully informed and explained to the above named person a description of the listed elements of informed consent.

Signature Date

Position

Witness Date

APPENDIX B

DATA SHEET

Chart number ______________________________

Today's Date and Time ____________________

Date and Time of Birth ___________________

Age in Hours ______________________________

Weight ____________________________________

Apgar at 1 min. _________ 5 min. __________

EDC____

Gestational Age by EDC ___________________

Type of Circumcision _____________________

Temperature of Room ______________________

Time of 1st T.	1st Temp.	Time Circ Began	Time Circ. Ended	T. 5" After	T. 15" After	Length of Procedure

Screening for Complications of Pregnancy, Labor, Delivery, and Neonatal Period.

_____Pre-Eclampsia

_____Eclampsia

_____Placenta Previa

_____Abruptio Placenta

_____ROM over 24 hours

_____Diabetes

_____Abnormal length of labor

_____Cesearan Section

_____Low Apgar at birth

_____Hypoglycemia

_____Taking medication

_____Prolonged hypothermia after birth

APPENDIX C

TABLE 19

DEMOGRAPHIC VARIABLES OF STUDY

Subject	Weight In Pounds	Length Of Procedure	Age In Hours & Minutes	Type of Circumcision
1	6.25	8 minutes	61 hr-7 min	Gomco
2	6.81	7 minutes	36 hr-30 min	Plastibell
3	8.09	5 minutes	28 hr-3 min	Plastibell
4	8.38	11 minutes	63 hr-23 min	Gomco
5	8.13	11 minutes	42 hr-16 min	Plastibell
6	7.06	12 minutes	54 hr-20 min	Plastibell
7	7.25	10 minutes	44 hr-42 min	Plastibell
8	7.50	7 minutes	24 hr-30 min	Plastibell
9	7.66	21 minutes	51 hr-23 min	Gomco
10	8.22	9 minutes	63 hr-42 min	Gomco
11	7.91	7 minutes	32 hr-32 min	Plastibell
12	7.72	14 minutes	27 hr-28 min	Plastibell
13	7.06	8 minutes	26 hr-38 min	Plastibell
14	5.63	8 minutes	48 hr-5 min	Gomco
15	7.00	17 minutes	60 hr-13 min	Plastibell
16	7.78	18 minutes	65 hr-41 min	Plastibell
17	5.50	6 minutes	71 hr	Gomco
18	8.50	3 minutes	59 hr-30 min	Gomco
19	6.72	12 minutes	44 hr-44 min	Plastibell
20	8.75	5 minutes	66 hr-39 min	Plastibell
21	8.25	8 minutes	48 hr-38 min	Plastibell
22	7.69	12 minutes	30 hr	Plastibell
23	8.47	4 minutes	52 hr-17 min	Gomco
24	7.69	15 minutes	30 hr-15 min	Plastibell
25	6.19	14 minutes	45 hr-47 min	Plastibell
26	7.25	11 minutes	54 hr-10 min	Plastibell
27	6.50	12 minutes	48 hr-6 min	Gomco
28	6.56	11 minutes	25 hr-33 min	Plastibell
29	7.56	33 minutes	24 hr-13 min	Plastibell
30	8.06	4 minutes	45 hr-29 min	Plastibell
$\bar{X}$	7.40	10.76 min	45 hr-53 min	
SD	0.85	6.02	16 hr-28 min	
Range	5.5 to 8.75	3 to 33 min	24 hr-13 min to 71 hr	

APPENDIX D

TABLE 20

DEMOGRAPHIC DATA OF GESTATIONAL AGE
1 MINUTE AND 5 MINUTE AGPARS
AND ROOM TEMPERATURE

Subject	Gestational Age	1 Minute Apgar	5 Minute Apgar	Room Temperature
1	40 weeks	8	10	76
2	40 weeks	7	9	77
3	38.5 weeks	9	9	78
4	40.5 weeks	8	10	76
5	39 weeks	7	9	76
6	42 weeks	9	9	76
7	38 weeks	8	10	76
8	39.5 weeks	8	10	76
9	41 weeks	8	10	77
10	40 weeks	9	9	77
11	39.5 weeks	8	9	76
12	38 weeks	9	10	76
13	39.5 weeks	9	10	77
14	39.5 weeks	8	9	76
15	42 weeks	9	9	78
16	41 weeks	8	9	78
17	39 weeks	8	9	77
18	39.5 weeks	9	9	77
19	41 weeks	9	10	77
20	41 weeks	8	10	78
21	40 weeks	8	10	77
22	41 weeks	8	10	77
23	40 weeks	9	10	77
24	41.5 weeks	8	10	77
25	41.5 weeks	9	10	77
26	39 weeks	9	10	76
27	40 weeks	8	10	76
28	39 weeks	8	9	78
29	40 weeks	8	10	78
30	41 weeks	8	10	77
$\bar{X}$	40.05 weeks	8.3	9.6	76.8
SD	1.08 weeks	0.59	0.49	0.74
Range	38-42 weeks	7 to 9	9 to 10	76 to 78

APPENDIX E

TABLE 21

TEMPERATURES BEFORE AND AFTER CIRCUMCISION

Subject	Temperature Before Circumcision	Temperature 5 Minutes After Circumcision	Temperature 15 Minutes After Circumcision
1	97.9	98.2	98.4
2	98.4	98.2	98.4
3	97.9	98.2	97.9
4	98.4	97.9	98.2
5	96.6	97.0	97.6
6	96.3	96.7	96.9
7	97.3	97.3	97.4
8	98.8	98.8	98.4
9	97.6	98.2	98.1
10	98.1	98.1	98.0
11	97.7	98.2	97.8
12	98.2	98.4	98.4
13	98.6	98.6	98.8
14	97.2	97.3	97.4
15	97.6	98.1	97.8
16	97.3	97.4	97.5
17	97.6	97.7	97.9
18	98.4	98.4	98.6
19	98.2	97.9	97.9
20	97.0	96.9	97.1
21	97.7	97.7	97.8
22	97.8	97.9	97.9
23	97.4	98.3	97.6
24	98.1	98.7	98.7
25	97.1	97.0	97.4
26	97.9	98.1	97.9
27	98.1	98.3	98.4
28	96.6	96.8	96.9
29	98.4	98.0	98.0
30	98.2	97.7	97.4
$\overline{X}$	97.74	97.86	97.88
SD	0.62	0.57	0.50
Range	96.3 to 98.8	96.7 to 98.8	96.9 to 98.8

REFERENCES CITED

Aitken-Swan, J. and Baird, D. 1965. Circumcision and cancer of the cervix. British Journal of Cancer. 19:217-27.

Anders, T. F., Sachar, E. J., Kream, J., Roffwarg, H. P., and Hellman, L. 1970. Behavioral state and plasma cortisol response in the human newborn. Pediatrics. 46:532-37.

Anders, T. F., and Chalemian, R. J. 1974. The effects of circumcision on sleep-wake states in human neonates. Psychosomatic Medicine. 36:174-79.

Apt, A. 1965. Circumcision and prostate cancer. Acta. Med. Scand. 178:493-504.

Berman, W. 1975. Urinary retention due to ritual circumcision. Pediatrics. 56:621.

Blainey, C. G. 1974. Site selection in taking body temperature. American Journal of Nursing. 74: 1859-61.

Bolande, R. P. 1969. Ritualistic surgery-circumcision and tonsillectomy. The New England Journal of Medicine. 280:591-96.

Boyd, J. T., and Doll, R. 1964. A study of the aetiology of carcinoma of the cervix uteri. British Journal Of Cancer. 18:419-34.

Burger, R., and Guthrie, T. H. 1974. Why circumcision. Pediatrics. 54:362-66.

Carbary, L. J. 1975. Circumcision: ancient rite, modern operation. Nursing Care. 8:26-27.

Clark, A. L., and Affonso, P. D. 1976. Childbearing: a nursing perspective. Philadelphia: F. A. Davis Company.

Datta, N. S., and Zinner, N. R. 19711. Complication from plastibell circumcision ring. Urology. 9:57-58.

Duncan, D. B. 1955. Multiple range and multiple F tests. Biometrics. 11:1-42.

Eiger, M. S. 1972. The case for circumcision. Today's Health. 50:14-15.

Emde, R. N., Harmon, R. J., Metcalf, D., Koenig, K. L., and Wagonfeld, S. 1971. Stress and neonatal sleep. Psychosomatic Medicine. 33:491-97.

Eoff, M. J. F., Meier, R. S., and Miller, C. 1974. Temperature measurement in infants. Nursing Research. 23:457-60.

Frand, M., Berant, N., Brand, N., and Rotem, Y. 1974. Complication of ritual circumcision in Israel. Pediatrics. 54:521.

Gairdner, D. 1949. The fate of the foreskin. British Medical Journal. 2:1433-37.

Gallagher, A. G. P. 1972. Complications of circumcision. British Journal of Urology. 44:720-21.

Gee, W. F., and Ansell, J. S. 1976. Neonatal circumcision: a ten-year overview: with comparison of the Gomco clamp and the Plastibell device. Pediatrics. 58:824-27.

Genesis 17:10-12.

Guyton, A. C. 1976. Textbook of medical physiology. 5th edition. Philadelphia: W. B. Saunders Company.

Hand, E. A. 1950. History of circumcision. Journal of the Michigan State Medical Society. 49:573-74; 578.

Hardy, J. D., Gagge, A. P., and Stolwijk, J. A. editors. 1970. Physiological and behavioral temperature regulation. Springfield, Illinois: Thomas Company.

Horwitz, J., Schussheim, A., and Scalettar, H. E. 1976 Abdominal distension following ritual circumcision. Pediatrics. 57:579.

Klauber, G. T. 1973. Circumcision and phallic fallacies, or the case against routine circumcision. Connecticut Medicine. 37:445-48.

Klauber, G. T., and Boyle, J. 1974. Preputial skin-bridging. Urology. 3:722-23.

Korones, S. B. 1976. High-risk newborn infants. Saint Louis: The C. V. Mosby Company.

Leiter, E., and Lefkovits, A. M. 1975. Circumcision and penile carcinoma. New York State Journal of Medicine. 75:1520-22.

Lutz, L., and Perlstein, P. H. 1971. Temperature control in newborn babies. Nursing Clinics of North America. 6:15-23.

Marshall, V. F. 1954. Should circumcision of infant males be routine? Medical Record and Annals. 48:790-92.

Morgan, W. K. C. 1965. The rape of the phallus. Journal of the American Medical Association. 193:123-24.

Ozturk, O. M. 1973. Ritual circumcision and castration anxiety. Psychiatry. 36:49-60.

Pillitteri, A. 1976. Nursing care of the growing family: a maternal-newborn text. Boston: Little, Brown and Company.

Preston, E. N. 1970. Whither the foreskin? a consideration of routine neonatal circumcision. Journal of the American Medical Association. 213:1853-58.

Ravich, A. 1965. Role of circumcision in cancer prevention. Acta. Urol. Japan. 11:76-86.

Reeder, S. R., Mastroianni, L., Martin, L. L., and Fitzpatrick, E. 1976. Maternity nursing. 13th ed. Philadelphia: J. B. Lippincott Company.

Report of the Ad Hoc Task Force on Circumcision. 1975. By Hugh C. Thompson, M.D., Chairman; Lowell R. King, M.D.; Eric Knox, M.D.; and Sheldon B. Korones, M.D. (American Academy of Pediatrics) Pediatrics. 56:610-11.

Selye, H. 1956. The stress of life. New York: McGraw Hill Book Company.

Selye, H. 1976. Stress in health and disease. Boston: Butterworths.

Speert, H. 1953. Circumcision of the newborn. Obstetrics and Gynecology. 2:164-72.

Talarico, R. D., and Jasaitis, J. E. 1973. Concealed penis: a complication of neonatal circumcision. The Journal of Urology. 110:732-33.

Talbert, L. M., Kraybill, E. N., and Potter, H. D. 1976. Adrenal cortical response to circumcision in the neonate. Obstetrics and Gynecology. 48:208-10.

Taylor, P. K., and Rodin, P. 1975. Herpes genitalis and circumcision. British Journal of Venereal Diseases. 51:274-77.

Tennes, K., and Carter, D. 1973. Plasma cortisol levels and behavioral states in early infancy. Psychosomatic Medicine. 35:121-28.

Terris, M., Wilson, F., and Nelson, J. H. 1973. Relation of circumcision to cancer of the cervix. American Journal of Obstetrics and Gynecology. 117:1056-66.

Treece, E. W. and Treece, J. W. 1973. Elements of research in nursing. Saint Louis: The C. V. Mosby Company.

Trier, W. C. and Drach. G. W. 1973. Concealed penis: another complication of circumcision. American Journal of Diseases of Children. 125:276-77.

Verhonick, P. J., and Nichols, G. A. 1968. Temperature measurement in nursing practice and research. The Canadian Nurse. 64:41-43.

Williams, J. K. and Lancaster, J. 1976. Thermoregulation of the newborn. The American Journal of Maternal Child Nursing. 1:355-60.

Winer, B. J. 1971. Statistical principles in experimental design. New York: McGraw Hill Book Company.

Wrana, P. 1939. Circumcision. Archives of Pediatrics. 56:385-92.

BIBLIOGRAPHY

Books

Appley, M. H., and Trumbull, R., editors. 1967. Psychological stress: issues in research. New York: Appleton-Century-Crofts.

Babson, S. G., Benson, R. C., Pernoll, M. L., and Benda, G. I. 1975. Management of high-risk pregancy and intensive care of the neonate, 3rd ed. Saint Louis: The C. V. Mosby Company.

Dahl, N., and Frazier, S. A. 1976. Series 1. The first six hours of life. Neonatal thermoregulation. Module 1. New York: The National March of Dimes, publisher.

Spence, J. T., Underwood, B. J., Duncan, C. P., and Cotton, J. W. 1968. Elementary statistics, 2nd ed. New York: Appleton-Century-Crofts.

Articles

Cansever, G. 1965. Psychological effects of circumcision. British Journal of Medical Psychology. 38:321-31.

Circumcision: a balanced report based on facts, not conjecture. 1971. Patient Care. 5:56-60; 62; 67-68; 71-73.

Circumcision: guidance for parents and recommended surgical techniques. 1971. Patient Care. 5:77-78; 80-81; 84-86.

Curtis, J. E. A. 1971. Circumcision complicated by Pulmonary embolism. Nursing Mirror and Midwives Journal. 132:28-30.

Dagher, R., Selzer, M. L., and Lapides, J. 1973. Carcinoma of the penis and the anti-circumcision crusade. The Journal of Urology. 110:79-80.

Daly, C. D. 1950. The psycho-biological origins of circumcision. The International Journal of Psycho-analysis. 31:217-36.

Diaz, A., and Kantor, H. I. 1971. Dorsal slit. Obstetrics and Gynecology. 37:619-20.

Fitzgerald, W. D. 1971. Circumcision is barbarous. Northwest Medicine. 70:681-82.

Grossberg, P., and Hardy, K. J. 1973. Carcinoma of the penis. The Medical Journal of Australia. 2:1050-51.

Harnes, J. R. 1971. The foreskin saga. Journal of the American Medical Association. 217:1241-42.

Hazards of temperature taking. 1970. British Medical Journal. 3(1):4-5.

Hillman, D. A., and Giroud, J. P. 1965. Plasma cortisone and cortisol levels at birth and during the neonatal period. Journal of Clinical Endocrinology and Metabolism. 25:243-48.

Kirkpatrick, B. V., and Eitzman, D. V. 1974. Neonatal septicemia after circumcision. Clinical Pediatrics. 13:767-68.

Mason, J. W. 1968. A review of psychoendocrine research on the pituitary-adrenal cortical system. Psychosomatic Medicine. 30(2):576-607.

Meyer, H. F. 1971. Practical pediatrics. Resident and Staff Physician. August: 93-94.

Morgan, W. K. C. 1965. Re: The rape of the phallus. Journal of the American Medical Association. 194(3):195-97.

Morgan, W. K. C. 1967. Penile Plunder. The Medical Journal of Australia. 1:1102-103.

Pare, W. P. 1977. Body temperature and the activity-stress ulcer in the rat. Physiology and Behavior. 18:219-23.

Patel, H. 1966. The problem of routine circumcision. Canadian Medical Association Journal. 95:576-81.

Pietzsch, T. T. 1971. Fifty consecutive cases of circumcision with the "plastibell" circumcision device. The Medical Journal of Australia. 1:1380-82.

Richards, M. P. M., Bernal, J. F., and Brackbill, Y. 1976. Early behavioral differences: gender or circumcision? Developmental Psychobiology. 9:89-95.

Rubenstein, M. M., and Bason, W. M. 1968. Complication of circumcision done with a plastic bell clamp. American Journal of Diseases of Children. 116:381-82.

Schlosberg, C. 1971. Thirty years of ritual circumcisions. Clinical Pediatrics. 10:205-209.

Sellars, J. H., and Yoder, A. E. 1961. A comparative study of temperature readings. Nursing Research. 10:205-209.

Selye, H. 1973. The evolution of the stress concept. American Scientist. 61:692-99.

Should circumcision be done routinely? 1967. Medical Aspects of Human Sexuality. 1:26-33.

Smith, R. M. Temperature monitoring and regulation. Pediatric Clinics of North America. 16:643-60.

Snell, J. A. 1975. A method of bloodless circumcision. The Medical Journal of Australia. 2:474-76.

Stern, E., and Neely, P. M. 1972. Cancer of the cervix in reference to circumcision and marital history. Journal of American Medical Women's Association. 17:739-40.

Stern, L., Lees, M. H., and Leduc, J. 1965. Environmental temperature, oxygen consumption, and catecholamine excretion in newborn infants. Pediatrics. 36:367-73.

Stinson, J. M. 1973. Impotence and adult circumcision. Journal of the National Medical Association. 65:161 and 179.

Weiss, C. 1964. Circumcision in infancy. Clinical Pediatrics. 3:560-63.