

Massage and Touch Therapy in Neonates: The Current Evidence

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Infant massage was first introduced in China in 2nd century BC. Massaging the newborn has been a tradition in India and other Asian countries since time immemorial. Various oil-based preparations have been used depending on the regional availability. There has been a recent surge in this ancient art particularly as a therapy among parents and professionals in the Western world. Evidence exists supporting the benefits of touch and massage therapy. We reviewed the literature to look at the various techniques of providing massage, its benefits, possible mechanism of action and adverse effects. The review suggests that massage has several positive effects in terms of weight gain, better sleep-wake pattern, enhanced neuromotor development, better emotional bonding, reduced rates of nosocomial infection and thereby, reduced mortality in the hospitalized patients. Many studies have described the technique and frequency of this procedure. Massage was found to be more useful when some kind of lubricant oil was used. Harmful effects like physical injury and increased risk of infection were encountered when performed inappropriately. The review also discusses the different hypotheses put forward regarding the mechanism of action. As of now there are very few studies describing the long term impact of neonatal massage.

Key words: *Benefits, Massage, Newborn, Oil.*

Touch refers to contact between objects. The touch in newborns can be active or passive. Passive touch can be delivered as a care touch or massage. Care touch refers to the touch associated with feeding, changing diapers, handling, holding, kangaroo care (KMC), or examination of newborn. A methodological touch intended to stimulate the baby is referred to as massage(1). Positive touch, a term coined by Cherry Bond, involves various types of infant touch-interactions including massage.

The practice of neonatal massage has been flourishing for decades in the Indian subcontinent. There has been a recent surge of interest in the Western world about this traditional art. Touch Research Institute in Miami was established in 1990 to look into various aspects related to this subject. Neonatal intensive care unit is considered a stressful environment with loud noise of equipment, alarms

and bright lights. Neonatal massage may help these neonates reduce the stress levels and has been suggested to improve the growth and development of preterm and low birth weight infants(2). This review intends to analyse the benefits, drawbacks, and possible mechanism of massage therapy in newborn infants.

THE TRADITION

Systematic application of touch is called massage. Massage of newborn can be done with or without a lubricant to reduce the friction between the surfaces. The lubricant used can be oil or a powder. Neonatal massage has been a traditional practice in India, Bangladesh, Nepal and other neighbouring countries.

In a survey conducted among women in Nepal about this traditional practice, it was observed that 89.5% of women give oil massage(3). Mustard oil

was the most common (99.7%) oil used for massage(3). The massage is usually started within 12h of birth by grandmother or any other elderly lady of the house.

Approximately 15-20 mL of oil is heated and garlic and spices are occasionally added(3). The baby is massaged with oil over the entire body and the massage is done 1-3 times in a day(4). The perception of the society about massage in newborn is that it prevents cold/cough, provides warmth, keeps the skin smooth and makes the bones stronger(4,5). It was observed that massage was more prevalent in home delivered infants as compared to those born at a health-care setting(4).

EFFECTS OF INFANT MASSAGE

Weight gain: Weight gain is the most consistent parameter associated with massage therapy in neonates. In a study by Scafidi, *et al.*(6), forty preterm infants (mean gestational age 30 weeks; mean birthweight 1.17 kg) were subjected to tactile/kinesthetic stimulation of 45 minutes per day (three sessions of 15 minutes each) for 10 days. It was observed that infants who received massage had 21% greater weight gain (34 vs 28 g). The weight gain was observed to be 47% greater in another study on preterm infants (mean gestational age 31 weeks; mean birthweight 1280 g) who received similar session of massage therapy(7). Similar results (weight gain of 21.9%; 4.24g/day) were also observed by Mathai, *et al.*(8). Most of the studies have enrolled medically stable infants >30 weeks of gestation. The effect of massage therapy in infants <30 weeks is not known.

Sleep-wake pattern: Infants who receive massage therapy appear more alert and spend less time in sleep(9). In a study by Kelmanson, *et al.*(10), infants less than 36 weeks of gestation (birth weight <2.5 kg) subjected to massage till 8 months of age, had improved quality of sleep with less awakening during sleep. These infants were more active during the day. It also hastened the onset of sleep(11).

Infant behavior: Preterm infants receiving massage therapy scored better on the Brazelton behaviour assessment scale(12) in terms of 'orientation', 'range of state' 'regulation of state' and 'autonomic

stability'(8). Improved scores on mature habituation, orientation, motor, and range of state behavior were observed in another study(7). Preterm infants (mean gestational age 30 weeks) who received moderate pressure therapy (5 days) were less fussy, cried less and showed less stress behavior(13). Infants who received oil massage were seen to show fewer stress behavior in the form of grimacing and clenched fist(14). Massage treatment improves the mother infant interaction and thus enhances their bonding(15).

Nutritional purpose: Topically applied oil to preterm skin (thin and vascular) can be absorbed systemically and serve nutritional purposes(16). Serum triglyceride levels were significantly raised in preterm infants (less than 34 week gestation) who received oil massage with safflower oil and coconut oil 4 times a day for 5 days(17). An increase serum level of linoleic acid (essential fatty acid) was reported from soybean oil (vegetable oil) massage on SGA infants that resulted in improved anthropometric parameters(18). However, serum triglyceride levels were comparable in another study comparing massage with or without oil(19).

Local effects on skin: Oil massage results in improved thermoregulation by decrease in the convection losses through skin. In a study in Nepal, the incidence of early hypothermia in the first 2 hours after delivery was reduced by nearly 50% and the incidence of late hypothermia in the first 24 hours after birth was reduced by 30% by implementing one of three interventions after delivery (kangaroo care, traditional mustard oil massage under a radiant heater, or plastic swaddling)(20). Greater increase in temperature has been noted in preterm infants who receive massage therapy(21). Oil massage has also been shown to remove the dead cells of skin and improve the texture of skin by preventing the dryness and cracking of the skin(22). Massage therapy has been shown to improve the skin barrier function(23).

Other benefits: Level of energy expenditure was significantly lower among preterm infants who received the standard massage therapy for 5 days(24). This could apparently explain the better somatic growth seen in infants receiving massage

therapy. Incidence of late onset sepsis (positive blood cultures and CSF cultures) has been shown to be significantly less among infants (750-1500 g) subjected to tactile-kinesthetic stimulation(25). Infant massage is considered to reduce the length of the hospital stay and hence reduce the cost of medical care(6,7,24). It was traditionally thought that infant massage makes the bones stronger. In a study by Aly, *et al.*(26) on preterm infants (28-35 weeks gestation), the degree of bone formation was measured in terms of serum type I collagen C-terminal propeptide (PICP). It was observed that there was a significant increase in PICP levels in infants who received combined massage and physical activity. In another study, DEXA (dual energy X ray absorptiometry) scan was performed as a marker of bone mineralization, and infants who received massage therapy by mother and trained professionals showed a greater score when compared to controls(27). The effect of bone mineralization by physical activity in preterm infants needs further evaluation and the existing data is insufficient(28). Massage has also been used for short term benefits of decreasing the pain before heel stick injury(29). Massage with sesame oil has also shown to improve the circulation to *massaged* area as documented by femoral artery blood velocity, diameter and flow(30).

Decreased mortality: In a randomized controlled trial conducted at Bangladesh(31), it was observed that infants born before week 33 of gestation who received topical emollient treatment with safflower oil or aquaphor (petrolatum, mineral oil, mineral wax, lanolin alcohol) were 41% less likely to develop nosocomial infections than controls. This resulted in lesser mortality in the study group. It was concluded that skin application of sunflower seed oil provides protection against nosocomial infections in preterm very low birthweight infants.

UNDERLYING MECHANISMS: PHYSIOLOGICAL EFFECTS

Various mechanisms are postulated for the weight gain shown by the infants who receive massage therapy. It was initially thought that weight gain from massage therapy was secondary to increase in caloric consumption resulting from altered sleep-wake

pattern. However, in a study by Dieter, *et al.*(32) it was observed that although infants who received massage therapy for 5 days spent less time sleeping, the caloric consumption was same and did not contribute to the observed weight gain(32). In a study conducted by Diego, *et al.*(33), a significant increase in vagal activity was noticed during the period of 15 minute massage therapy. The vagal activity was interpreted from ECG as a measure of heart rate variability. It was also seen that there was a significant increase in gastric motility in post massage period. It was postulated that massage causes increase in vagal activity, hence improved gastric motility; this leads to better absorption of nutrients resulting in better weight gain.

Preterm infants who received massage therapy (15 min for 5 days) showed an increase in serum insulin and serum IGF-1 levels(34). This could also explain the weight gain associated with massage therapy. Neonatal massage has been suggested to decrease the levels of stress by decreasing the serum cortisol and norepinephrine(11,14,35), and increasing urinary excretion of epinephrine and norepinephrine(36). Elevated levels noted in this study could represent improved sympathetic maturation which might in turn hasten the lung maturation. Authors have also suggested that immune function improves with neonatal massage which apparently acts by enhancing the natural killer cells (NK cells)(37).

Tactile kinaesthetic stimulation causes significant increase in heart rate(8,38). However, the values were within the physiological range(8). No change was observed for respiratory rate, blood pressure and apnea in infants receiving massage therapy(8).

THE PROCESS OF NEONATAL MESSAGE

There are no fixed guidelines describing the exact methodology of neonatal massage. Field(39), in her extensive research, has described a method which has been followed by most studies on massage therapy(39). The Field's massage therapy consists of both tactile and kinesthetic stimulation. Massage is given in 15 minute sessions starting with 5 minutes of tactile stimulation followed by 5 minutes of kinesthetic stimulation and ending again with 5 min of tactile stimulation. Three massage sessions need

to be performed per day. Most of the studies have given massage treatment for duration of 2-4 weeks(40). The massage can be given by trained medical professional or by mother. It has been shown that mothers are as effective as trained professional in delivering the massage(41).

A conducive environment needs to be established before initiation of massage. A room with soft light, warm temperature, and low noise levels is ideal. Massage should be given between the feeds and ideally 45 min to 1 hour after a feed to avoid regurgitation or vomiting of the feed. It should involve the entire body starting from head, neck, trunk and extremities. A firm stroke with flat of fingers is used during massage therapy. Moderate pressure is shown to be better than light pressure massage in terms of weight gain(13).

In a well designed study by Mathai, *et al.*(8), the procedure was divided into 2 phases of tactile stimulation: first phase, the baby is placed prone and 12 strokes of 5 sec each is provided starting from head, neck, shoulder to buttocks; second phase the baby is placed supine 12 strokes of 5 sec each was given starting from face, cheeks, chest, abdomen, upper limb, lower limb, palms and soles. Third phase consists of kinesthetic stimulation in which alternate flexion and extension movements are performed at major joints: ankle, knee, elbow and shoulder. The massage can be interrupted for a few minutes when the baby passes stool/urine or cries excessively.

OIL MASSAGE

Massage of newborn may be done using a lubricant (oil) to avoid friction between the surfaces. The local community in Nepal perceives mustard oil as the best for its smell, taste and color(3). The choice of the oil depends upon the availability, cost and safety. Sunflower oil, coconut oil, and sesame oil are also commonly used for massage.

Field, *et al.*(14) documented that massage with oil makes the baby more alert, and shows fewer stress behaviour as compared to those massaged without oil(14). In a well designed study, three groups viz coconut oil, mineral oil and placebo were compared in infants 1.5-2 kg who received massage therapy 4 times a day for duration of first month.

Infants who received coconut oil massage showed a better weight gain velocity as compared to mineral oil(42). In another study, infants massaged with sesame oil showed greater improvement in anthropometric parameters as compared to mustard and mineral oil(30).

DRAWBACKS OF MASSAGE THERAPY

NICU care of preterm infants involves the policy of minimal touch to avoid acquiring infection. Massage therapy in this subgroup can theoretically increase the chances of infection. Most of the studies pertaining to newborn massage have enrolled medically stable preterm infants. The efficacy, safety of massage in sick preterm has not been established.

There are many babies who develop allergic rash with use of oil. Massage needs to be avoided in medically unstable newborns and infants on ventilator. On the contrary, it was observed that infants who had experienced more complications benefited more from the massage, with better weight gain than medically stable infants(43). Massage therapy should be avoided in infants with cardiac diseases(44).

CONCLUSION

Benefits of massage include stimulation of circulatory and gastrointestinal systems, better weight gain, lesser stress behaviour, positive effects on neurological and neuromotor development and infant-parent bonding, and improved sleep. Massage with oil results in improved skin condition (increased hydration and surface lipid content) and barrier function, resulting in reduced loss of trans-epidermal water and improved thermoregulation, transcutaneous absorption of fatty acids contributing to improved nutrition and better somatic growth. Massage therapy is considered a safe practice and there are no significant harmful effects, if performed appropriately. Long term benefits of massage are not well established and hence it remains unclear whether this cost effective, culturally acceptable, traditional practice is an effective use of time.

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manuscript. All authors approved the final version.

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