

Plagiocephaly and Brachycephaly in Infants

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Great Ormond Street Hospital report that 50% of all babies suffer with plagiocephaly. Research in 2006 reports that of that 50%, 19% will suffer with some degree of developmental delay. This has long term implications for families and schools as children will need more support as they are growing up.

Definitions

Plagiocephaly



Parallelogram shape

- Posterior flattening on one side
- Anterior forehead flat on opposite side to the posterior flat spot
- Anterior ear, forehead and eye shift on same side
- Posterior bulge

Brachycephaly



- Bilateral occipital flattening
- Increase width to length ratio
- Increase posterior head height
- Bilateral frontal bulging
- Bilateral bulging over ears
- Cupping of ears
- Some degree of asymmetry

Differential Diagnosis:

Craniosynostosis

- Premature skull fusion, resulting in ridging and odd head shape
- 1 in 2-3000 births
- X-ray / CT for investigation
 - Severe cosmetic abnormalities with palpable / visible suture lines
 - Inconsistencies of head growth
 - Changes in behaviour and developmental abnormalities

Causes of plagiocephaly:

Back to Sleep campaign

Change in lifestyles

- More car seats

- Integrated systems

- Baby bouncers, chairs, swings

In utero flattening

- engaged for long periods

- reduced uterine space

- reduced amniotic fluid

- large headed baby

Hypotonia

Torticollis

Presentation at Birth

Lack of awareness of the condition

- importance of tummy time – 30mins per day

- increase development of motor skills

Risk Factors

Prematurity

Multiple Births – reduced space, less time postnatally to change baby's position

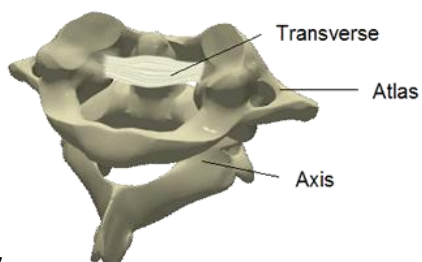
Large birth weight babies

Large head

Infants with congestion – raising the mattress to an incline can increase the flattening effect

Torticollis

Plagiocephaly and Osteopathy



Anatomy

Strong atlas (1st vertebrae) with transverse ligament – attaches skull to neck and prevents forwards movement of the axis (thus preventing paralysis).

If a strong/slow/fast/assisted birth, occiput (back of the skull) buckles, not the atlas, due to strength of transverse ligament (it is estimated that it would take a force of 85kg to rupture!).

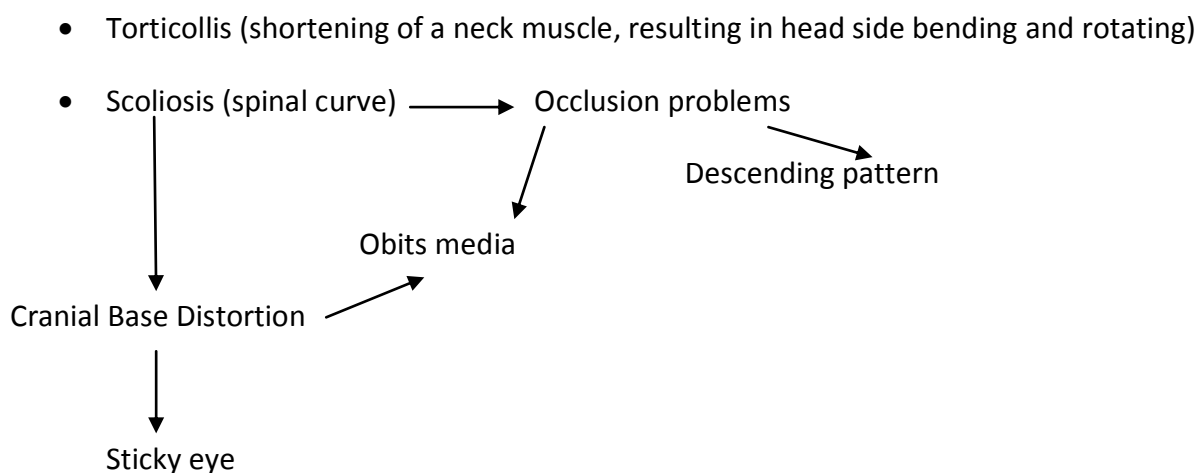
Skull bones fuse at 2yrs, therefore before then, there is greater scope for re balancing

Vault (top of the skull) membranous at birth, then hardens – designed to accommodate the forces of birth

Vault can remould, but harder for the cranial base (bottom of the skull)

Osteopathy treats the cranial base, the helmet adjusts the vault

Plagiocephaly may be part of another problem:



Osteopathy is Preventative, Curative, has No Side Effects and Works with the body.

Osteopathic Assessment:

Check full rotational range of baby’s neck

Check symmetry of sucking

Parents can help re-position during – playtime

feeding

tummy time

Hourly passive movements and stretching

When assessing, check position of ears – indicates cranial base distortion

From 6mths harder to treat, but with frequent sessions can still help

Treatment intervals to cover growth spurt times

At 6 years adult development of teeth and head and therefore patterns and strains set

Osteopathic Treatment:

Restore osseous (bony) integrity and flexibility, especially of flattened area.

Encourage free flow of cranial and spinal CSF, thereby facilitating baby’s own intra-cranial hydrostatic pressure, to encourage self correction

Cranial banding can help with non-cooperative children

Use of cranial banding and orthodontics are helpful alongside treatment

Correct the bite to correct other symptoms

Consider the potential that the banding / orthodontics can push the asymmetry elsewhere

Look at helping the body adapt
Give the system some slack to change

When treating, assess baby with and without banding

Plagio affects the midline, therefore baby only sees one side of their environment if their head is constantly turned – potential to affect drainage and immune system.

Advise parents that self correction will take place much faster if baby's head is kept off flat surfaces

Give handouts on re-positioning advice

AIDS TO TREAT OR PREVENT PLAGIOCEPHALY

Cranial Banding

Before banding, the osteopath can assess the degree of readiness of the infant's cranial tissues to change and respond favourably to an orthotic. This will influence comfort and therefore compliance

The osteopath will monitor the whole body response to an orthotic and ease any local or distant limiting factors

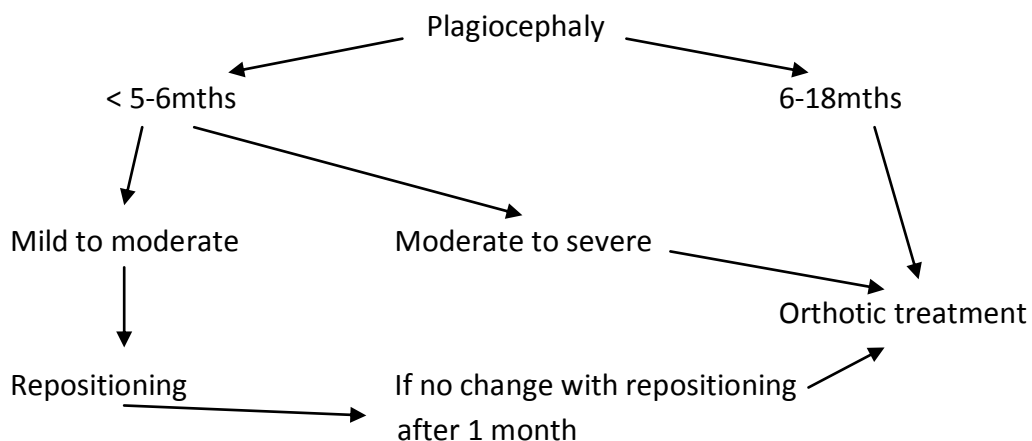
Osteopathic treatment in plagiocephaly is directed primarily at the tissues of the cranial base. If the cranial base changes, the vault will follow. If the cranial base remains asymmetrical, changes in the vault may be inadequate or even conflicting (ie. with banding and no treatment)

Criteria for banding

- Plagiocephaly not Synostosis
Head shape regarded as not normal, visually or by measurement
Deformity moderate to severe
Repositioning not effective
Neck strength good to tolerate orthosis
Full parent commitment and compliance

Time frames for intervention of cranial banding

Will not band before 3 ½ to 4 months



How banding helps

- Holds on the prominent areas
- Encourages growth in the flattened areas
- Does not restrict growth, but redirects it
- Treatment starts between 4 to 7 mths and lasts 3 to 6 mths
- Takes longer in older babies
- The earlier it is started, the more rapid the effects

Within the helmet

- The build up occurs in the posterior-lateral quadrant to obtain symmetry
- A build up is added as needed

Assessment

Birth History – management, SCBU, presentation, prematurity, multiples?

Post natal history – born with moulding or appeared later? Neck issues and cranial treatment?

Take measurements:

Circumference

A-P and mediolateral diameter

CI (cranial index) = $\frac{\text{cranial width}}{\text{cranial length}} \times 100\%$

Normal 78 – 83% (The normal range is becoming higher as babies generally have flatter heads. Normal is 78%, but since 'back to sleep' campaign, normal is nearer 83%)

Moderate 84 – 89%

Severe > 90%

Take a line from frontal zygomatic to earion, approx 30° from A-P line to calculate asymmetry:

normal 0 – 6mm

moderate 6 – 12mm

severe > 12mm

- Baby can sit on parents lap
- A net is put over the baby's head to smooth down the hair
- A hand held laser light is passed over the head
- A 3D computer model is generated

Discuss what can be expected

Aim to halve asymmetry value

Outcome determined by age / compliance / length of time

Plagiocephaly improved by 60 – 90%

Brachycephaly improved by 5-10%

Protocol

- Scan
 - 2 weeks later fitting
 - 1st review 1 week after fitting
 - review after every 2 – 4 weeks
 - Over 14mths of age, review every 6wks
 - Final scan and photo at end of treatment
 - Scan reports to clinician
- Band on 1hr, off 1hr, then on every 2hrs, and increasing every week
 - Baby sleeps in band after 3 days
 - wears for 23hrs per day – off ½ hr in morning and evening for cleaning
- £1950 for full cost of treatment (standard charge, regardless of how many checkups etc). Initial assessment free – incl scan and report

Repositioning Advice

- Re-distribute weight onto prominent area of head
- Use rolled up towel under sheet to tilt whole body off flattened side
- Turn baby round in the cot / changing mat / play gym, so always facing toys, lights and mum, away from flattened side
- At night reposition baby's head away from flattened side, once in a deep sleep. If no flattening has occurred, prevent it from happening by alternating the baby's head to each side between night time feeds.

Carrying and Handling

- Tummy time
 - Changing nappy
 - Feeding – milk / solids
 - Car seat
 - Position of cot in the room
 - Lights in the nursery
 - Play time
 - Use sling
- Hold baby on hip and lean forward
 - Hold baby on lap with toys/mum on opposite to flat side
- Bumbo chairs for short periods (avoid bouncer chairs)

Tummy time

- On chest watching TV
Propped up with towel
Lie on floor in front of baby
Toys / mirrors / lights
Over knees
Carry on tummy
On parents chest/tummy
Undress them on their tummy
Take baby's socks off to help with traction on the floor
Massage baby whilst on their tummy

Stretching

- Aim for active stretching (ie. baby is doing it)
- Position toys
Rolling ball
TV
Remote cars
In pool
Rolling
Balance
Sitting to lying
Side to side in pool

Aids for re-positioning

- Lillakuddis baby pillow – a soft baby pillow recommended by the Swedish Department of Health and Welfare. Put pillow under cot sheet to follow UK SIDS guidelines www.lillakuddisbabypillow.co.uk
- Love nest pillow. A soft heart shape pillow with cut out middle to cradle baby's head. Use in cot under sheet, under play gym, changing mat and in car seat. Purchase from Jojomamanbebe
- Widgey pillow – V shaped pillow to support baby whilst lying on front to play. NCT catalogue
- Car seats are being developed in the USA with curved head rests (Safety First and Maxi Cosi). Look at Maxi Cosi 'Pebble'.
- Sleep curve mattress (designed by an Osteopath) www.sleepcurve.com
 - Designed to cradle the head and accommodate weight and pressure
 - Designed to promote optimum posture and mimics the natural way a mother holds her baby
 - Aids breathing by preventing the head being pushed forwards onto the chest

- Head remains in a neutral position keeping airways open - ?helps to prevent SIDS (research needed)
- Use pre 4/5mths as preventative measure
- Has deep air channels to help with dissipation of heat
- Not made of memory foam, which can heat up and would mould to the flat spot
- Different sizes to fit Moses basket, crib and cot. Large mattress available to use on changing table and under play gyms
- Recent trials at Alder Hey in self correction with mattress after 8mths still good. Preliminary findings positive, results out soon

Research:

Neurodevelopment in children with plagiocephaly 2006

Mental development index scores		Psychomotor development index scores	
Accelerated	0%	Accelerated	0%
Normal	90%	Normal	74%
Mildly delayed	7%	Mildly delayed	19%
Severe delay	3%	Severe delay	7%

'CONCLUSION: This study indicates that before any intervention, infants with deformational plagiocephaly show significant delays in both mental and psychomotor development. Also of particular note is that no child with deformational plagiocephaly showed accelerated development.'

Further research needed:

Does it improve if untreated, if so how much? (Difficult to test)

Is it only cosmetic?

Does cranial osteopathy improve cranial banding results?

Are there any negative effects to banding? In 20 years of banding, no negative effects reported so far.

Once the banding is removed, does any degree of plagiocephaly return?

What degree of flattening does there need to be before it affects psychomotor and mental development?

Compare rates of change between: no intervention, cranial osteopathy treatment, repositioning techniques, banding treatment.