Kinematic Imbalance Due to Suboccipital Stress in the Infant, A Literature Review

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Abstract

Background: Kinematic Imbalance due to Suboccipital Stress (KISS) syndrome is a phrase that was coined by Dr. Heiner Biedermann in 1992. It is believed that the pathogenetic base for KISS syndrome stems from irritation of the suboccipital structures of the cervical spine. Infants suffering from this syndrome demonstrate many symptoms including: torticollis, cranial asymmetry, colic and sleeping disorders just to name a few. Dr. Biederman and his fellow colleagues felt that it was important to develop a system to identify infants suffering from this upper cervical dysfunction and to apply manual therapy techniques to resolve this problem.

Objective: The objective of this paper is to review the most current literature on KISS syndrome. It is important to first review the history of the development of the syndrome. Then the diagnostic methods and protocols will be evaluated. This includes symptomatic criteria, causative factors, and diagnostic imaging findings. Finally, treatment options, including chiropractic care, and case studies will be examined.

Data Collection: Resources utilized in this review included indexed/referenced journal articles, text and reference books and internet websites. Pubmed, Ebscohost, and Mantis were the databases used to find journal articles related to the subject matter. The Mobius library catalog was used at the Learning Resource Center of Logan College of Chiropractic to find books relating to KISS Syndrome. There were very limited amounts of material on this subject indicating the need for further research and publications. All of the articles obtained referenced the same main information and studies presented by Dr. Biedermann and his colleagues.

Data Synthesis: The principle criterion for inclusion/exclusion included selecting sources available through Logan College of Chiropractic Learning Resources Center and the internet, and the use of the most current information available on KISS Syndrome.

Conclusion: After reviewing the current literature on KISS Syndrome, it is apparent that more efforts should be spent on further research. More case studies or clinical trials are needed to document the effectiveness of chiropractic care, or manual therapies in children with this syndrome. Considering that the majority of the information available on this subject was presented by Dr. Biedermann, it would be a benefit for other doctors to present their own cases. This would give more credibility to the diagnosis and treatment of KISS Syndrome.

Key Words: KISS Syndrome, Kinematic Imbalance due to Suboccipital Strain, Upper Cervical Chiropractic, Pediatric and chiropractic care

Introduction

Often a new "syndrome" is developed out of the need to categorize frequently presenting clinical symptoms. Doctors or therapists recognize a pattern in the way patients present, but are unable to fit the symptoms into a current diagnosis. With the patients' best interest in mind, it is important for doctors to formulate methods of identifying similar problems among the patient population. This allows for quicker diagnoses and, ultimately, quicker care and recovery for the patient.

After treating newborns and small children for many years, Dr. Biedermann and his colleagues felt it was necessary to begin investigation of certain postural problems they continued to encounter (1). This was the beginning of the development of KISS Syndrome. Kinematic Imbalance due to Suboccipital Stress was initially proposed in Germany in 1990 however, it wasn't until 1992 that it was introduced to the Anglo-American public (2). Today, the term Stress is interchangeable with the term Strain. The development of this new syndrome gave physicians a means to recognize similar problems in the pediatric population that had previously went undetected or were simply ignored.

KISS Syndrome infants present with a wide array of clinical signs that range from torticollis to asymmetric posture of the trunk to colic, just to name a few. Quite often parents are led to believe that postural asymmetries in their children are not important and can be left to resolve on their own. The pathogenetic importance is played down and the parents are given advice to place their baby in certain sleeping positions and the problem will "go away" (3).

It is believed that irritation to the suboccipital structures of the cervical spine is the pathogenetic base for this syndrome. The upper cervical spine is closely evaluated in these patients for misalignment and improper movement (1).

The purpose of this literature review is to demonstrate the need for further studies on KISS Syndrome. I will uncover the facts about KISS Syndrome through the most current information available. The history of the development of KISS Syndrome classification, the methods of diagnosis and the treatment modalities will be discussed. There are a limited number of case studies, but these will also be reviewed to gain a better understanding of the clinical picture of this syndrome.

Discussion

Background

The human body and its workings are and will continue to be a mystery. This mystery is the driving force that keeps humankind continually searching for answers, a means to understand the body's intricate processes. Most often the adult human frame is studied extensively, and the knowledge gained is frequently applied to infants and children. For example, when medicating children, physicians use a formula to determine a child's dose. But this formula is based on the details of how an adult body can metabolize and process this medication (2). It is critical to understand that the infant functions in a completely different manner than the adult. Dr. Biedermann discusses the role of 'form and function' in the human body. He states that in an adult, the balance between form and function has a tendency to depend more on form. The adult body is not growing and developing, so the functions depend on the structures that already exist.

In the infant, this situation is completely reversed. Dr. Biedermann states that with babies, "function (and malfunction) determines the developing form (1)." In manual therapy, this difference is very apparent. In the adult, efforts are aimed toward repairing structures without being able to heal. This is because matter has limitations, one of which is its ability, or lack thereof, to completely return to an uninjured state. However, in children, because they are still developing their form, this is not always the case (1). In the newborn, morphology is soft and not yet defined in all of its details. It is easy to see that external factors are able to exert a greater influence in an 'unfinished' body (2). It seems obvious to want to help a child grow into an adult with as little damage to its 'form' as possible. This is one of the main purposes of diagnosing and correcting the

Kinematic Imbalance due to Suboccipital Strain in the infant. Is it not extremely important to make the journey and the transition into adulthood as smooth as possible?

KISS Syndrome, presented by Dr. Heiner Biedermann in 1990, is a relatively new concept to manual therapy practitioners. Dr. Biedermann postulates that the suboccipital area is at the root of the problem for these infants. He states that the frontal angle of C0-C1 is increased in infants, and this leaves this area vulnerable to trauma. This basically means that the occipital condyles are considerably more flat in the infant compared to the adult (9). This area is vulnerable for a few reasons. Dr. Williams concludes that there are three main reasons; 1. There is insufficient restriction of motion between C0-C1, 2. There is insufficient muscular fixation between the head and the trunk, and 3. There is undeveloped neuromotor control of these structures (6). It is important to detect problems in this area because of the long-term negative effects it may have for the infant.

Diagnosis

Diagnosis of KISS Syndrome initially was based upon fixed posture and the ensuing asymmetry. But over the years, feedback has helped to gain a much clearer picture of the essentials of KISS (2). As the details of diagnosis became more refined it became apparent that there were actually two groups of presenting symptomatology. KISS was split into KISS I and KISS II (1). The following are the clinical markers for the two groups (2):

KISS I: Fixed Lateroflexion

- Torticollis
- Unilateral microsomia
- Asymmetry of the skull
- C-Scoliosis of neck and trunk
- Asymmetry of gluteal area
- Asymmetry of motion of the limbs
- Retardation of motor development of one side

KISS II: Fixed Retroflexion

- Hyperextension (during sleep)
- (Asymmetrical) occipital flattening
- Shoulders pulled up
- Fixed supination of the arms
- Cannot lift trunk from ventral position
- Orofacial muscular hypotonia
- Breastfeeding difficult on one side

Other features include: colic, baby is unable to lie on his or her back, a uniform sleeping position and the child cries if the parent tries to change its position, sleeping disorders such as the baby regularly wakes crying through the night, extreme sensitivity of the neck, blockages of the sacroiliac joints, fever of unknown origin and loss of appetite (12), retarded development of one hip joint and deformities of the feet (3). It is critical to thoroughly question the parents about the details of the status of their child. It is in the minute details that the full picture can be uncovered (1).

It is also important to consider age when attempting a diagnosis. The diagnosis of KISS Syndrome is reserved for newborns, 3-4 weeks of age to about 1 year of age (2). Most commonly, the initial diagnosis occurs around the age of 6 months (1). This is often where the diagnosis of KISS gets ignored because at about 1-2 years of age, the symptoms seem to 'spontaneously' disappear. But the malfunction is still present, silently waiting to reappear later in life (2). This delayed reappearance is referred to as KIDD, or KISS-induced dysgnosia and dyspraxia (1).

Dysgnosia is considered "any cognitive disorder," and dyspraxia means "impaired or painful functioning in any organ" according to Stedman's Concise Medical Dictionary (18). It seems that those who suffer from dysgnosia have improper functioning of their perception (2). Developmental dyspraxia is a disorder characterized by an impairment in the ability to plan and carry out sensory and motor tasks (19). There is a wide range of symptoms found among the children diagnosed with KIDD, they include (2):

- Imbalance of the muscular coordination with asymmetrical tonus of the postural muscles
- Shortened hamstrings
- Kyphotic posture with hyperlordosis of the cervical spine and hypotonus of the dorsal muscles of the thoracic area, often accompanied by orofacial hypotonia
- Scoliotic posture in sitting and/or standing position
- Shoulders at different height
- Sacroiliac joint mobility asymmetrical often with asymmetry of leg rotation

- Balance tests insufficient and mostly asymmetrical
- Insufficient coordination of vestibular input
- Acoustic orientation laborious; locating the source of an 'interesting' noise difficult
- Combination of arm and leg movements difficult, e.g. jumping-jack test
- Fidgeting and restlessness, sometimes tics
- Using eye control to compensate for lack of proprioception, refusing to lie down supine, clinging with one hand to the examination table
- Decompensation when the close range is invaded by the examiner; wild resistance against palpation

These children are considered clumsy and lack fine motor skills. They are often reported as being difficult with other children (2). The complexity of KIDD warrants this subject to be researched separately, but does support long-term negative effects of untreated KISS (1).

It is normal for there to be some asymmetries immediately after and for the next few weeks following birth. The baby has had to travel through the birth canal and a realignment of the asymmetrical cranial bones and a resorption of soft tissue edema and/or hematomas take time. An initially asymmetrical posture should be noted and observed. At that time it is not necessary to seek treatment, but if this asymmetry persists after 3-4 weeks it is advisable to further evaluate the infant. If additional symptoms appear it is also important to seek further evaluation. The first step is to check for

restricted range of movement of the head. This impaired motion is often a sign of a "protective immobilization" of the upper cervical spine (1).

If a child presents with the clinical signs of KISS, and there is diminished motion of the head further evaluation is warranted. This is accomplished through a radiographic examination. Specific radiographs of the cervical spine are taken using "Gutmanns" technique (3). The information acquired through the analysis of these radiographs makes the difficulty in taking them on an infant worthwhile. These pictures can complement and verify the clinical findings as well as show the proper direction of impulse the doctor should use. In 80% of the cases the de-symmetrization of the occipito-cervical junction follows an established pattern and the direction of the corrective impulse is confirmed. These cases would not need the radiographs. However, it is the remaining 20% that pose the problem. It is necessary to obtain pictures of these children's spine in order to determine the proper direction of correction. They do not follow the established pattern of clinical findings that can be correlated to a set direction of impulse correction (1). The radiological evaluation also helps to find malformations that may alter the treatment procedure (3).

Approximately 42% of the time the Atlas (C1) has misaligned to the right in relation to the occiput, whereas in 31.6% of the cases the Atlas has moved to the left. In 19.3% of cases the Atlas had misaligned in comparison with C2, the Axis. In the remaining 7% assessment was not possible or there was some sort of dysplasia (3).

It has been stated that selection of the direction of the corrective impulse without the analysis of radiographs seems to be the most plausible cause of poor outcomes (3).

Causative Factors

It has been said that 'the birth canal is one of the most dangerous passages we have to traverse in our whole life'. In order for the fetus to travel through the birth channel, the head must be aligned with the trunk. This puts the head in a turned position and leads to asymmetrical positioning of the occipito-cervical junction throughout that entire portion of the delivery. MRI studies have shown that this puts stress on the intracranial structures and 'apparently healthy newborns have shown a high percentage of signs of microtrauma of brainstem tissues in the periventricular areas'. However, the 'not yet fully developed brain' shows an enormous capacity to cope with trauma at this stage because most newborns are able to overcome and repair these lesions. But trauma still occurs (1). This being said, birth trauma has been at the top of the list of causative factors for KISS Syndrome. A "natural" birth process causes trauma, as stated above, so the use of forceps, vacuum, or other extraction devices obviously adds to the degree of trauma. Prolonged labor, oblique presentation or intrauterine malposition and multiple pregnancies are also considered risk factors (2). All of these listed factors could cause irritation to the suboccipital structures, leading to the pain-avoiding immobilization seen in the fixed posture of a KISS child (1).

After treating many children over the now 17 years since the inception of KISS, Dr. Biedermann states that another factor has come into play. Doctors began to notice that having treated one child, there was a high probability of seeing the next sibling as well, especially if the next sibling was of the same sex. This makes the possibility of genetic predisposition as a contributing factor very likely (2).

Another interesting observation came when parents started asking if these doctors treated adults too. These parents started correlating their children's symptomatology to that of their own when they were a child. It made it evident that the initial assertion presented in the beginning must be revised. "Birth trauma and a genetic predisposition cooperated to produce KISS, and both aspects of this etiology combined give our diagnostic efforts a more solid base (2)."

Differential Diagnosis

As with any state of dysfunction it is very important to consider the differential diagnosis list. This also holds true with KISS. The catalog of differential diagnoses is short but must be visited when examining a KISS baby (2).

At the top of this list, and one of the most important factors to consider, are spinal tumors. Their occurrence is very rare, but if left undetected can lead to severe consequences (1). Specialists note that an incorrect initial diagnosis is the rule and not the exception when it comes to spinal tumors in children (1). Dr. Biedermann and his colleagues summarized the items that would necessitate further diagnostics. They are as follows:

- Inadequate trauma
- Late onset of symptoms
- Multiple treatments before first presentation
- Crescendo of complaints
- 'Wrong' palpatory findings

Plain film radiography would not furnish the necessary information to diagnose spinal tumors; in this case MRI studies are by far the best method (2).

A second key group of cases are those with an inflammatory component. These cases are quite rare during the first year of life, but get increasingly relevant from the second year on. A typical inflammatory problem of the childhood years is called Grisel's syndrome (2). This is a non-traumatic subluxation of the atlanto-axial joint in children, and is thought to be caused by an inflammatory process. Grisel's syndrome has been described in common otolaryngic entities such as otitis media, tonsillitis, pharyngitis and tonsillar or cervical abscesses. It has also been noted after common surgical procedures such as tonsillectomy, adenoidectomy or mastoidectomy. Grisel's syndrome is thought to be caused by the spread of septic exudates through venous and lymphatic channels. These channels connect the peripharyngeal space and the cervical venous plexus, and this causes the spread to the upper cervical spine (17).

The next factor to consider when assessing an asymmetric skull is plagiocephaly. Plagiocephaly is a "malformation of the head marked by an oblique slant to the main axis of the skull." More recently this term has been applied to any condition characterized by a persistent flattened spot on one area of an infant's head (16). The most important aspect to evaluate is whether the plagiocephaly is synostotic or non-synostotic. A synostotic plagiocephaly must be excluded because this is an undoubted indication for surgical treatment (2).

Treatment

"Manual therapy is one of the oldest forms of healing we know. It is a craft; an interpersonal action involving direct bodily contact (1)." The most common method of treatment described in the reviewed literature is manual therapy. The procedure used is basically an impulse thrust (3). In most cases, about 80%-85%, the direction of the

impulse is determined by the radiographic findings. In the other cases the direction of restricted movement, the palpation of the segmental dysfunction or the local pain reaction serve to help determine the line of correction (1).

The baby is placed on its back on the examination table and the doctor first performs the kinesiological and neurological evaluation. Then the segments of the cervical spine are assessed. It is important to correlate these finding with the radiological findings in order to determine the most appropriate line of correction as stated above. The adjustment itself consists of a short thrust using the proximal phalanx of the medial edge of the second finger (3). Most often the adjustment is delivered in a lateral to medial line of correction, however some cases a rotational component can be added. This is really an exception in small children, however, as it can lead to negative results. It is also important to note that in KISS type II, where the fixed retroflexion is the main component, the correction can be applied via the transverse process of C1 in a sagittal direction (1).

Most children respond with only one treatment, with just 15% requiring and additional session. It is important to stop all other forms of physiotherapy after their initial adjustment until they have a check-up 4 weeks later. This allows the infants body time to "digest" the adjustment and make the necessary changes its body needs (3).

It is believed that selecting the specific technique without the analysis of the radiographs lessons the effectiveness of the treatment (1). It is in these cases that the less than encouraging results occurred (3). One source reports fatality after spinal manipulation in an infant. This was a case involving a 3 month old infant who developed reflex apnea followed by massive and fatal brain edema after the manipulation. The

technique used was Vojta therapy (5). It was not reported if the doctor utilized the proper radiological examination. This, however seems to be the only case with such a severe outcome. The only other negative outcomes reported were: the child cried for a moment, and in two cases the children vomited after the adjustment, but this had no negative effect on the overall outcome (3). It was also stated that these children had been vomiting before the therapy and during the initial evaluation as well (1).

Dr. Biedermann feels that the technique itself needs "subtlety and long years of experience" to master. He states that in the hands of experienced manual therapists the risk of a negative outcome is very minimal (3). Chiropractors, osteopaths and physiotherapist are among the most common treating entities (2).

Case Reports/Clinical Trials

Dr. Biedermann and his colleagues presented the following cases for review (3):

- Linda (4 months)

  "Cesarean due to pelvic presentation, nothing exceptional post partum. The mother was alarmed by the fact that Linda had had difficulty in controlling her head position and always slept on her right side. The left arm was less frequently used than the right. On examination, these findings could be reproduced: painful palpation of the right side of the upper cervical spine; the flexion range on the left side is half of that to the right. The manipulation is based on the radiograph and the impulse given from the right side. Follow-up after 6 months symmetric development, normal sleep patterns."

- Markus (5 months)

  "Twin, after birth hypoxia was documented. A routine examination 6 weeks afterwards showed C-scoliosis and hypomobility of the left arm. Examination showed decreased muscular tonus on the left half of the body, insufficient head control and opisthotonos. Slight asymmetry of the facial part of the skull, asymmetry of the positional reflexes, e.g., Landau, Collis traction test. Impulse manipulation based on the radiological findings. Monitored by the pediatrician at home. Posture and mobility were symmetric; the vertebral spine straightened."

- Charlotte (6 months)

  "From the beginning Charlotte was unable to turn her head to the left; she developed pronounced facial scoliosis. Handling the baby was difficult as she often cried; her motor development was retarded. Recurrent fever of unclear origin.

  A few hours after the first treatment she moved her head spontaneously to the left. At the check-up a month later the swelling of the right face was much less pronounced, the fever had ceased and the motor development was found to have accelerated.

  At a check-up 1 year later no anomalies were detected."

No clinical trials specifically related to KISS syndrome could be located in the review of current literature.

Conclusion

The basic foundation that the diagnosis and treatment of KISS syndrome lies upon appears to be solid; however, there are not enough clinical trials or published case reports to support this. There is no substantial scientific evidence that manual therapy is useful in caring for infants with KISS syndrome. Dr. Biedermann has dedicated his life's work to caring for these children, but the responsibility should not only lie with him to research this topic. He has laid the groundwork, now field doctors need to present more case studies or clinical trials to help document the effectiveness of chiropractic care, or manual therapies in children with this syndrome. This would give more credibility to the diagnosis and treatment of KISS Syndrome.

Dr. Terry Rondberg states that "every baby needs to have a healthy spinal column." Without a healthy spinal column, Dr. Biedermann believes that the long term effects are far-reaching, and can be seen in older children and adults. Dr. Stephen Williams posed this idea: Is it possible that the problems seen in chiropractic offices on a daily basis are the consequences of not correcting individuals as babies? These are novel ideas and set the stage for discussion and research, but alone, they do not prove anything.

REFERENCES

1. Vernon H. editor. The Cranio-cervical Syndrome: Mechanisms, assessment and treatment. Oxford:Butterworth Heinemann; 2001 p.207-227
2. Biedermann H. editor. Manual Therapy in Children. Edinburgh:Churchill Livingstone; 2004 p.285-319.
3. Biedermann H. Kinematic imbalances due to suboccipital strain in newborns. Journal of Manual Medicine 1992; 6:151-156.
4. Biedermann H. Kinematic imbalances due to suboccipital strain in newborns and young children. Manuelle Medizin 1993; 31:97-107.
5. Brand P, Engelbert R, Helders P, Offringa M. Systematic Review of Effects of Manual Therapy in Infants with Kinetic Imbalance due to Suboccipital Strain (KISS) Syndrome. The Journal of Manual & Manipulative Therapy 2005; (20:4) 209-214.
6. Williams S. The 36-Hour Pediatrics Certificate Program: Session #2 presented at Logan College of Chiropractic Nov 2005
7. Fysh P. (D.C.) Kids Need Chiropractic Too: Suboccipital Strain in Newborns. Dynamic Chiropractic 1994 Jun 3 vol.12 issue 12.
8. Children's Health. www.stopSIDS.org/childhealth.html
9. Biedermann H. Manual therapy in children: Proposals for an etiologic model. J Manipulative Physiol Ther 2005;28(3):el-15
10. Zweedijk F, Bekaert W. Posterior Plagiocephaly: Review of the literature and an osteopathic approach. www.osteopathie.nl/magazine/plagiochephayly.htm

11. Maggi B. The KISS Syndrome in Children [Lecture]. Eur J Chiropr 2001; (47:2) 99-101.

12. Willams S. Pregnancy and Paediatrics: A Chiropractic Approach. Southampton:Stephen P. Williams; 2005 p.51-53

13. Eriksen K. Upper Cervical Subluxation Complex: A Review of the Chiropractic and Medical Literature. Lippincott Williams & Wilkins; 2004

14. Rondberg, Terry A. Chiropractic First—The Fastest Growing Healthcare Choice Before Drugs or Surgery. USA:The Chiropractic Journal; 1998 p.79-88

15. Biedermann H. Koch L. The Differential Diagnoses of KISS Syndrome. Manuelle Medizin 1996; 34:73-81

16. Kelly, K. What is Plagiocephaly. www.plagiocephaly.org Oct 2005

17. Martinez-Lage J. Morales T. Cornejo V. Inflammatory C2-3 subluxation: a Grisel's syndrome variant. Archives of Disease in Childhood 2003; 88:628-29

18. Dirckx J. editor. Stedman's Concise Medical Dictionary for the Health Professions 4th Edition. Lippincott Williams & Wilkins; 2001

19. National Institute of Neurological Disorders and Stroke www.ninds.nih.gov/disorders/dyspraxia/dyspraxia.htm

20. Lesny IA. Developmental dyspraxia-dysgnosia as a cause of congenital children's clumsiness. Brain Dev. 1980;2(1):69-71