



"The Hidden Pattern: Unveiling Axial Triradius As A Diagnostic Clue In Intellectual Disabled Childrens"

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Abstract

Intellectual impairment is a condition in which mental development is inadequate or impaired, causing individuals to encounter difficulties in everyday learning. Some of the conditions with intellectual disability can be seen in dermatoglyphic due to the same period of formation between fingerprints and the neocortex. The "Atd" angle is a dermatoglyphic trait formed by drawing lines between the triradii below the first and last digits and the most proximal triradius on the hypothenar region of the palm. In the present study Atd angle was analyzed in intellectual disabled children irrespective of age, gender from prints of left and right palms. Significant difference is noted in the t' angle.

Keywords: Atd Angle, Dermatoglyphics, Intellectual Disability, Shodhana Therapy.

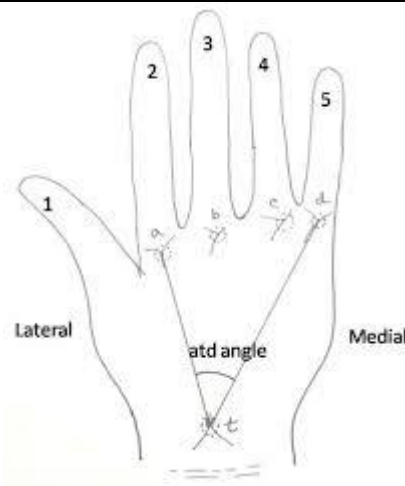
Introduction

The World Health Organization (WHO) defines intellectual disability as the significantly reduced ability to understand new or complex information, to learn and apply new skills (impaired intelligence). It imposes a large medical, psychological and social burden. It affects about 3% of population, yet the pathogenesis is poorly understood¹.

Dermatoglyphics is the scientific study of fingerprints on the hands, fingers, soles of feet, and toes². Many genes and the prenatal environment influence the fingerprint pattern, which does not change but instead increases in size³.

Atd angle is a dermatoglyphic pattern that indicates the degree of distal displacement of the axial triradius on the palm. It is a non-invasive, non-painful method of diagnosis. Dermatoglyphic deviations do not indicate a specific condition although it provides an incentive to undertake additional tests.

Atd angle is formed by drawing lines between the triradii below the first and last digits and the most proximal triradius on the palm's hypothenar region. The triradii are usually located on the distal palm, with "a" and "d" just below the second and fifth fingers respectively, and "t" somewhere between the wrist and the center of the palm. The angle is measured by drawing two straight lines through the "a" and "t" triradii and the "d" and then measuring the resulting angle. The more distal the position of "t", the larger the Atd angle⁴.



Fingerprints are formed between 12-19 prenatal weeks⁵, and the neocortex develops at the same time. The neocortex is the core of intelligence and cognitive function. Genetic factors influence both fingerprints and the neocortex. As a result, someone with a hereditary condition, particularly one caused by chromosomal abnormalities such as Down's syndrome etc will have a distinct dermatoglyphic pattern from the general population.

Materials and methods:

This study is a descriptive observational study with the cross-sectional approach, carried out at Alva's education foundation®.

The study was conducted in two phases:

1. Conceptual study: Literature related to Atd angle and its significance was collected from various journals and databases.
2. Pilot study was carried out on 10 subjects with intellectual disability associated with Down syndrome, Autism, ADHD.

Inclusion criteria:

- Age between 5-25years with previously diagnosed intellectually disabled children.
- Individuals of both genders.

Exclusion criteria

- Individuals with any other systemic disorders.
- Trauma, surgeries and congenital deformities related to hands.

Methodology

For atd angle measurement, entire palm was inked including wrist creases and hypothenar border. Sheet of paper was placed on foam rubber pad on a flat stable surface. Pressure was applied to the back of hand to fill the concavity of palm. Wrist of the person was placed on the bottom of paper and then the rest of the palm was pressed on the paper. Back of the hand was pressed down firmly for printing the centre. These palm prints were carefully observed for atd angle. The atd angle formed between lines drawn from the Tri radii at the base of index and little finger to the axial triradius was measured. Axial triradius was designated as 't'.



Dermatoglyphics:

Dermatoglyphics, a study of configurations of epidermal ridges on the volar aspect of hands and feet.

Embryonic development: The embryonic development of dermatoglyphic patterns, or fingerprints, occurs between the 10th and 16th weeks of gestation. In 10th week, the epidermis consists of three-layers periderm, intermediate layer, and basal layer. By 11th week the basal layer of the epidermis becomes undulated and forms folds into the dermis. These folds are called primary ridges and by the 16th week the primary ridges become well pronounced. The ridges spread from the initiation sites in waves, covering the palm and digits by the 17th week. The medial portion of the digits is the last area to acquire ridges⁶. Dermatoglyphic patterns are permanent and are mainly under genetic control. They are affected by environmental factors in the uterus.

Atd angle:

Axial Triradius Angle is a dermatoglyphic marker used to study palm patterns and their relationship with various diseases, including intellectual disability and neurodevelopmental disorders. It is influenced by various genetic, environmental, and neurodevelopmental factors. Genetic factors like chromosomal abnormalities, gene mutations etc. Pre-natal factors like maternal nutrition, prenatal exposure toxins, infections etc. The normal range for the Atd angle is 35–40°. Any deviation in the value indicates abnormality.

Observations:

Among 10 participants, 4 children were having down syndrome, 3 had Attention deficit hyperactivity disorder, 2 had autism spectrum disorder and 1 with schizophrenia.

Atd values of intellectual disabled children are listed below.

Group	Palm	<30°	30-65°	>65°
Down syndrome	Right	0	1	3
	Left	0	2	2
ADHD	Right	0	2	1
	Left	0	2	1
Autism spectrum disorder	Right	0	2	0
	Left	0	2	0
Schizophrenia	Right	0	3	0
	Left	0	3	0

From the obtained data it is found that among 10 participants of intellectual disabled children 6 were having positive family history.

Discussion:

Ubiquitous interest in the study of dermatoglyphics increased only in the last several decades, when it became ostensible that various patients with chromosomal abnormalities had unusual ridge configurations.

In dermatoglyphics, any divergence from the normal pattern and atd angle value represents a strong indicator of a specific abnormality. However, the values will not establish a diagnosis on their own, but they will motivate the physician to conduct a more thorough examination than usual in order to detect any concealed abnormalities.

It is known that, Atd angle and intellectual disability associated with down syndrome, ASD etc both are influenced by various genetic and environmental factors.

Literature reports, that average angle of normal individual is in range of 30-65°. In the current study, subject with down syndrome possess deviation in the atd angle. It may be due to various factors like presence of high position of triradius 't' on the palm. Presence of extra copy of chromosome 21 which disrupts normal genetic balance, Overexpression of genes on chromosome 21 and altered cellular migration patterns during embryonic development⁷ altogether these components affect the dermatoglyphic development.

In autism the deviation is due to increased ridge count, Abnormal pattern configuration and asymmetry of hands. As per the previous research it is found that gene mutations like CHD8, HOXA, HOXD associated with autism spectrum disorder may also influence Atd angle⁸.

Role of Ayurveda in intellectual disability?

Ayurveda, the holistic science apart from providing various therapeutic measures for diseases, mainly emphasizes on maintenance, promotion of health and prevention of diseases through diet and lifestyle regimen.

Ayurveda in pre-conceptional care:

Acharya charaka has emphasized that healthy *Garbha sambhava samagri* (*Ritu, kshetra, ambu, beeja*), *Shadgarbhakara bhava*, *Garbha Vruddikara bhava* is essential for healthy progeny⁹.

Acharya Vagbhata has described qualities of girl to be selected for marriage in detail. She should be from *Atulyagotriya* (non-consanguineous), should not be suffering from any diseases, must have complete body parts, should be healthy and must possess all good qualities. In present scenario as evidenced by the research studies it is found that consanguinity marriages are the one of the causes for mental retardation. To avoid these circumstances *Acharya's* centuries ago mentioned about *Atulyagotriya*¹⁰.

The notion of Preconceptional care in *Ayurveda*, aims to target the restoration of health status of both partners to improve the reproductive outcome through various preventive interventions.

Prevention measures include:

1. *Shodhana* therapies: -*Acharya* has advised to undergo *Shodhana* bio purification procedures) which involves procedures like *Vamana* (Therapeutic Emesis), *Virechana* (Therapeutic purgation) followed by *Basti* (Evacuative and Nutritive Enema) to ensure complete body purification¹¹.
2. Dietary Regimen-After proper *Shodhana* of body, male and female partner should follow strict dietary regimen because *Ahara* is primordial factor for normalcy and vitiation of *Doshas*. Man should use *Madhur aushadh siddha ghrita* and *Ksheera* in diet and women should consume *Tila* and *masha*.
3. Conducting *Putresthti yagya*: Repeated chanting is a process of gathering the divine and spiritual energies that help in transformation of different life issues thus benefitting each and every aspect of life.
4. *Pumsavana Samskara*: For the physical and mental development of the progeny in the womb of the mother, this *Samskara* is performed amidst chanting of the Vedic Mantras. The significance of this *Samskara* is to invoke celestial and excellent qualities in the child¹².

Hence, it is strongly recommended that Preconceptional care mentioned in *Ayurveda* is highly scientific and must be followed to revitalize the human being as well as to improve the reproductive outcome for getting healthy progeny

Role of *Ayurveda* in post-natal period:

Chudakarma : (Shaving of head): Hair of the child is removed through *Mundana Samskara*. *Charaka* has mentioned the utility of *Chudakarma* as *Paustika* (nutritive), *Vrishya* (aphrodisiac), *Ayushya* (increase longevity), *Suchi* (Cleanliness) and *Rupavirajana*¹³.

Acharya's have also mentioned various *Samskara* after birth which aids in physical and mental development of child.

As per previous clinical trials, Ashwati et al found *Shankhapushpi Choorna* with the proper dosage according to the age definitely improves the *Medha* of children with borderline intellectual functioning¹⁴. U Shailaja et, al proved that *Mustadi Rajayapana Basti* and *Baladi Yoga* proved to be more supportive in improving the motor activities and gross behavioral pattern in cerebral palsy children¹⁵.

Thus, by the usage of *Medhya Dravya's* (*Shankapushpi*, *brahmi*, *yashtimadhu* etc) and various therapeutic measures like *Basti*, usage of *Rasayana Dravya's* will improve overall health of child.

Conclusion

In clinical genetics, dermatoglyphics studies are of primary importance in chromosome abnormalities, limb formation. "Atd" angle is a dermatoglyphic trait used as pre diagnostic tool in various clinical conditions. Normal Atd angle ranges from 30 to 65 degree, whereas in the current pilot study cases of mental retardation revealed a range of <30 to >65 degree. Atd angle is non-invasive, non painful pre diagnostic modality which can be useful for society. Our *Acharya's* have centuries ago mentioned about preventive modality in genetic disorders by performing various procedures and *Samskara* which is known to have significant effect on child growth and development.

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