Autism Update in Twenty-first Century

Autism or autism spectrum disorders are neurodevelopmental disorders and are seen in about 1% or more of children. Neurodevelopmental disorders are the disorders of developing brain and include deviations from normal development of cognitive function, motor function like walking, speech, communication, etc. Limitations of communication, speech, social skills and repetitive behaviour are the characteristic features of autism. They manifest during first 2 – 3 years of life. It is important for clinicians, especially paediatricians and also laypersons to be aware of this challenging developmental variation as it is not very uncommon. Dr Leo Kanner, an Austrian- American psychiatrist and clinician described intelligent children who wanted to be alone and had obsessive insistence on sameness. The lack of communication and repetitive behaviour are the features of autism. The word 'Autism' comes from the Greek word 'Autos' meaning 'self – one's own'.

The first few years of life are very important for the growth and development of a child and as his/her behaviour evolves, the signs and symptoms of autism are noticed by observant parents or paediatrician. Many times developmental milestones are not achieved like other normal children. Children with autism mainly have speech delay and lack of social interaction. This may become obvious in the form of lack of eye contact and playing alone. Obsession with few objects or routine and repetitive actions are the other features suggestive of autism. The severity and spectrum of limitations and challenges due to autism are varied and hence, often the diagnostic labels such as 'Autism spectrum disorder', 'Pervasive developmental disorders' or 'Asperger syndrome' are used. Basically, these are limitations of social interaction and communication associated with repetitive behaviours. Some genetic disorders like Rett syndrome are characterised by autistic features as predominant symptoms. But for most of the cases of autism, although genetic etiology is likely, a definite cause cannot be found. It can be said that autism is a manifestation and the underlying causes can be very many. However, abnormalities in connections of brain cells with each other and chemicals transmitting signals in brain cells are likely to be the biological mechanisms responsible for autism.

The limitations in social interaction lead to significant problems in learning and functioning. Research work done during the last 2-3 decades has led to an improved understanding about signs and symptoms of autism. Many clinicians, researcher, teachers and parents are working in the area of autism. As a result the awareness about the condition has improved and it may be partly responsible for increased prevalence of autism noted in some recent studies. Like intellectual disability, autism is also common in boys than girls.

Diagnosis:

Diagnosis of autism has two parts. The first is to suspect and confirm autism. But as said previously autism can be of heterogeneous etiologies. It is a manifestation of many

disorders and it is necessary to find out the cause of autism, i. e. etiological diagnosis; in each case. Etiological diagnosis may not make any definite change in the treatment of the child but can help in giving prognosis and will be helpful to the family in future planning. Speech delay may become obvious because the child does not start babbling at around six months of age. Lack of recognition of face and lack of eye contact are the early manifestations. The parents realise that the child is different and behaving differently. The child does not seem to differentiate between a person and inanimate object like a table or chair, also does not respond to his / her name. These children do not imitate parents and do not smile when talked to. There may be obsession with one object or a toy with which the child will keep playing for the whole day. Repetitive activities like head banging, hand movements are commonly observed. Age of diagnosis depends on the severity of manifestations and observant nature of the parents. Many parents take time to decide whether their child has some problem or is just 'different' and will outgrow his / her behaviour. Speech delay may raise the suspicion of deafness which may be difficult to differentiate. Some children have very mild form of autism and may not be noticed till school age. There is no laboratory test to confirm the presence of autism. The pediatrician, psychologist, psychiatrist or developmental pediatrician can evaluate the child's behaviour and talk to parents about his/ her activities at home and decide whether the child suffers from an autism spectrum disorder. Early diagnosis of the problem is necessary as institution of early therapy may improve the learning abilities and outcome. Getting answer to the parents' questions about child's behaviour may help allay the parents' anxiety and search for diagnosis.

The child with autism may have some other disabilities or issues in higher prevalence as compared to normal children. One third of children with autism cannot learn to speak and many of them have associated intellectual disability. About seventy percent of children with autism have Intellectual Quotient [IQ] of less than 70. About five percent of children with autism have IQ more than 100 and some of them have excellent skills like music, memory etc. Convulsions, feeding difficulties and speech problems are commonly seen. Large head is seen in some children with autism and is a clue to some genetic etiologies like Fragile X syndrome or PTEN related autism. Regarding the various causes of autism, very little is known. Previously suggested association of autism with immunization does not have any supportive evidence. Rubella infection [German measles] in mother during pregnancy sometimes affects the baby in the womb [Congenital rubella syndrome] and causes damage to heart, eyes, ears and brain. Association of autism with congenital rubella syndrome has been noted. The other known causes of autism spectrum disorders are genetic and for cases with autism of unknown etiology, research on genetic causes is going on. Hence, we shall discuss about genetics aspects.

Genetics of Autism:

Our body is made up of small microscopic units, known as cells. These cells can be compared to bricks of a building. These cells are basic units of body of any living being. Each cell contains a nucleus which has genetic material that stores information and a master-plan to control the structure and function of our body. The genetic material is DNA [Deoxy ribonucleic Acid] which stores information in chemical language and its units are genes which code for various proteins forming structure and governing functions of our body. It is expected that there are about twenty thousand genes in our body and each gene is present as two copies; one inherited from mother and one from father. These genes are arranged on 23 pairs of chromosomes. Obviously one gets one set of 23 chromosomes from father and one from mother. Since the completion of Human Genome Project a lot of information about many genes has become available and the defects in the genes can be tested to identify the causes of genetic disorders. More than 6000 genetic disorders have been delineated and they can affect brain, bones, blood, heart, liver, skin, eyes and any organ system of the body. Disorders due to defects of genes and chromosomes causing autism and intellectual disability are also known.

Genetic testing can help in identification of the exact cause of autism in a child or patient. Before ordering the test, clinical evaluation, and family history are essential and the child should be evaluated by a clinical geneticist or a pediatrician or neurologist with expertise in autism. Clinical evaluation can give clue and supportive investigations like eye examination, brain and heart imaging and sometimes biochemical tests for genetic metabolic disorders many be needed. The genetic causes with autism or autistic features include chromosomal disorders, Fragile X syndrome, Tuberous Sclerosis, Phenylketonuria, Rett syndrome, PTEN gene related autism. The test for chromosomal analysis is karyotype and now a very high resolution chromosomal analysis is available and is known as cytogenetic microarray. Abnormalities detectable by cytogenetic microarray are present in about 10% children with autism. The tests for all the disorders are available in India. Clinical evaluation of the child is important so that the appropriate test can be ordered. In recent years all genes in our body can be tested in one go by a test called whole exome sequencing and can this can detect novel gene defects in research settings. It must be noted that the careful evaluation of the child by experts is essential for interpretation of these high end investigations. With all state of art evaluation, cause cannot be identified in 80% or more children with autism. Identification of etiology of autism continues to be a challenge for clinicians and researchers alike. However, if the cause is identified the family is benefitted in various ways. Their questions ‘why’ and ‘what ahead’ get answer. This may give them some peace of mind and help them concentrate on the therapy and habilitation of the child.

Autism is one of the highly researched subjects in last decade and better understanding of causative mechanisms may help in development of novel therapeutic

strategies. Complexities of development and functioning of brain are still enigmatic and poses great challenge to mankind.

Management

Once presence of autism is confirmed, the planning of management starts. The first step is to assess the child for his / her level of functioning, level of disabilities, strengths and associated problems like convulsions, behavioural problems, etc. This needs collaborative efforts of pediatrician, developmental specialists, psychologists and special educators. A special training program for each child based on his / her abilities and limitations need to be devised. Involvement and commitment of parents in the process is very essential for the success of the therapeutic program. The objective is not to 'cure' and make the child normal but to make the child as independent as possible and help him to lead useful and happy life. Special attention should be given to the abilities of the child. Acceptance of the parents about 'different' and 'special' nature of their child goes long way in the improvements in the child.

There are no medicines for autism. But the associated problems like hyperactivity, depression may need medicines with supervision of experts. Behavioural therapies are preferable in long run than the medicines. The claims of successful stem cell therapy or vitamin therapy or alternative forms of medicine are not supported by scientific evidence. It is advisable that the parents do not get themselves misguided by such advertisements though we agree that their hope of search for cure is justified and heartfelt. The goals need to be realistic. Some children with mild forms do quite well and function independently or semi-independently as adults. Many individuals need lifelong support and supervision. Support to the family in care of child is needed so that the family can learn to live happily with such special children. Though the understanding about causation of autism is improving and various treatment strategies are under research; the curative treatment appears to be elusive at present. Better abilities to understand genetic functioning of brain pathways and abilities to manipulate genes show some hope of novel treatments in decades to come.

Genetic Counseling

Autism or autism spectrum disorders has many issues and living with such a child with special needs, disabilities and lifelong dependence causes enormous stress on the family. An important fact to accept presently is that curative treatment is unavailable for autism. On this background, every family wishes that the next child in the family should not have the same problem. The process of helping the family to understand the disorder in the family, genetic aspects of the disorder, risk of recurrence in the sibling and ways to prevent recurrence is known as genetic counseling. The first step of genetic counseling is to identify the genetic cause of autism. As mentioned previously, if the cause of autism in the child is identified to be chromosomal disorder or single gene disorders like Fragile X syndrome, Rett

syndrome, etc. by genetic testing, then one can give appropriate risk of recurrence in the siblings. It may vary from 0 to 25%. If the genetic defect is identified in the affected child in the family, in the next pregnancy of the mother the baby in the womb can be tested at 11-12 weeks of pregnancy. This test is called as prenatal diagnosis. This helps the family to take decision about the pregnancy. If the baby in the womb is having the same genetic defect; then the family may opt to terminate the pregnancy if they wish not to have a similarly affected child. If the baby in the womb is negative for the genetic defect; the family can be reassured that the baby will not have the same disorder. It needs to be stressed that for providing prenatal diagnosis, it is necessary to know the genetic defect in the child in that family. The process of evaluation and testing of the child, hence, needs to be done before planning the pregnancy and preferably, by a clinician well versed with genetic testing.

As mentioned previously, for more than 80% of children with autism, cause cannot be identified by genetic testing. In such situation, exact risk of recurrence cannot be told and obviously, prenatal testing is not possible. It has been observed that if there are 100 families with one child with autism spectrum disorder; then 10 of them may have another child with similar problem. This mean the observed risk of recurrence is 10% and the possibility that the next child will not have autism is 90%. This information may help the family to take their reproductive decisions.

Autism: Future Ahead

Research on the fronts of understanding causes and pathology of autism; thus leading to treatment is an important activity at international level. Scientists are enthusiastic and hopeful for the possibilities of new treatments. At the same time, the society and the government has opened arms for Indian citizens with special needs. Improved availabilities of facilities for therapeutic interventions, special teachers, etc. are already showing miracles and bringing smiles on the faces of the 'special' families. These children and their parents bring smiles to our faces as well; their coping strategies help us learn to face the problems with courage and positivity.

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For more information about prevention of common genetic disorders,

see < http://sgpgi.ac.in/gen_book/1geneticsbooklet.html >