



DOWN SYNDROME: REPORT OF A CASE AND REVIEW OF LITERATURE

K. Saraswathi Gopal¹ and Sowmya Hemanthakumar^{2*}

¹Professor and Head, ²PostGraduate, Department of Oral Medicine and Radiology, Meenakshi Ammal Dental College & Hospital, Chennai, Tamilnadu, India.

ABSTRACT

Trisomy 21 (47,XY, +21 or 47,XX, +21) is the most common aneuploid condition compatible with survival at term. This trisomy causes Down syndrome (DS), a phenotype that was originally described by John Langdon Down in 1865. An incidence of 1 in 600 to 1000 live births in all races and economic groups. Approximately 95% of all cases of Down syndrome result from nondisjunction. Although the syndrome occurs in offspring of mothers of all ages, the risk increases with increasing maternal age. The present article discusses a case report of 12 year old girl patient with the classical features of Down syndrome.

Key words: Down syndrome, Trisomy 21.

Access this article online

Home page:

<http://www.mcmed.us/journal/ijacr>

DOI:

<http://dx.doi.org/10.21276/ijacr.2017.4.7.4>

Quick Response code



Received:06.07.17

Revised:19.07.17

Accepted:03.08.17

INTRODUCTION

Down Syndrome, Trisomy 21 or Mongolism, was first described by Dr. John Langdon Down in 1865, is the most common genetic disorder caused by the presence of all or part of a third copy of chromosome 21 and best known of all malformation syndromes. They may have delayed language development and slow motor development and a characteristic set of facial features. The features of Down syndrome can range from mild to severe.[1]

The incidence of Down syndrome, characterized by an anomaly of chromosome 21, is estimated to be per

800 to 1000 births. Humans normally have 46 chromosomes in each cell, divided into 23 pairs. Two copies of chromosome 21, one copy inherited from each parent, form one of the pairs. Chromosome 21 is the smallest human chromosome, spanning about 48 million base pairs (the building blocks of DNA) and representing 1.5 to 2 percent of the total DNA in cells.[2]

Here we present, a case report of a down syndrome patient.

Case Report:

A 12 year old female patient reported to the Department of Oral Medicine & Radiology with the chief complaint of pain in right lower back tooth region for past one week. History revealed that pain was intermittent, radiating in nature, which aggravates upon mastication and sensitive to hot or cold foods, nocturnal pain present and subsided upon medication. Review of medical history,

Corresponding Author

Sowmya Hemanthakumar

Post Graduate, Department of Oral Medicine and Radiology, Meenakshi Ammal Dental College & hospital, Chennai, India.

Email:sowmi.bio@gmail.com

child was diagnosed with down syndrome by his physician also had epileptic attack 10 years ago and under regular medication of tegretol 100mg twice daily. On family history, parents are of consanguineous marriage and all other family members are apparently normal. On personal history, patient had delayed milestones of growth and attained puberty a year ago. On general examination, Patient was conscious, co-operative but did not respond well to questions and skeletal anomalies include short statured with broad short neck, short broad hands, brachydactyly, gap between hallux and second toe. On extra-oral examination, small head(brachycephaly), flat

facies with increases interocular distance(hypertelorism), depressed nasal bridge, flat occiput, broad short neck. Narrow, upward and outward slanting of palpebral fissures, medial epicanthal folds are ocular anomalies, Small ears are observed(Fig.1). On intra-oral examination, peg-shaped maxillary lateral incisors are observed(Fig.2). On further investigations, Orthopantomogram revealed, no of teeth present: 28, coronal radiolucency involving enamel, dentin and pulp with ill-defined periapical radiolucency, coronal structure of 12 resembles as inverted cone shaped. Suggestive of peg lateral incisor in relation to 12 and periapical abscess in 46 region.(Fig.3).

Extra-oral Examination [Fig.1]



Intra-oral Examination [Fig.2]

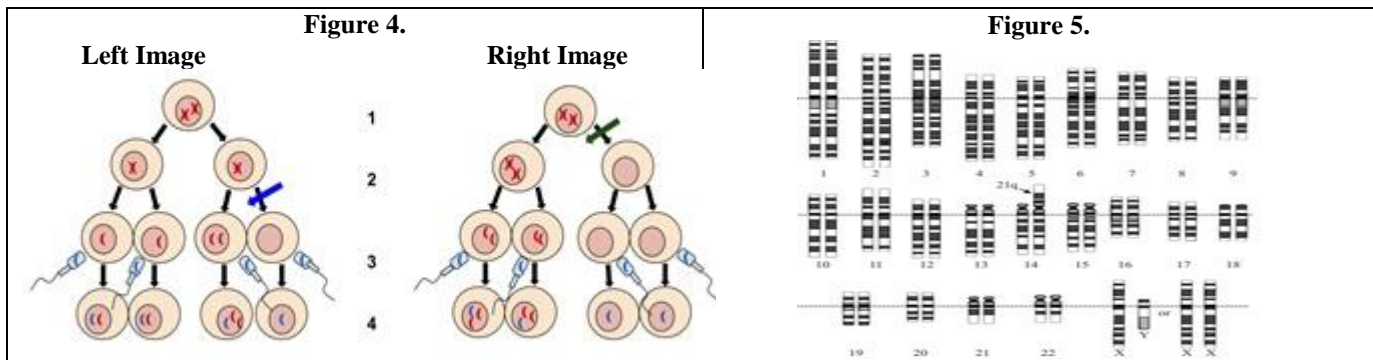


OPG[Fig.3]



Lateral Cephalogram





Findings	Percent
<i>Craniofacial</i>	
Flat nasal bridge	61
Flat occiput	76
<i>Eyes</i>	
Up-slanting palpebral fissures	79
Epicanthic folds	48
Brushfield spots	53
Strabismus	22
Nystagmus	11
<i>Ears</i>	
Dysplastic	53
Absent lobules	70
<i>Mouth</i>	
Open mouth	61
Fissured lips	56
Protruding tongue	42
Macroglossia	43
Furrowing of tongue	61
Narrow palate ^a	67
Irregular alignment of teeth	71

<i>Neck</i>	
Broad, short	53
<i>Chest</i>	
Flat nipples	56
Pectus excavatum	10
Pectus carinatum	8
Dorsolumbar kyphosis	11
<i>Abdomen</i>	
Diastasis recti	82
Umbilical hernia	5
<i>Genitalia</i>	
Small penis	70
Cryptorchidism	21
Small scrotum	37
<i>Hands</i>	
Short broad hands	70
Brachydactyly	67
Single palmar crease	52
Clinodactyly	59
Short fifth finger	59
Single flexion crease on fifth finger	20
<i>Feet</i>	
Gap between hallux and second toe	50
Plantar furrow	31
<i>Joints</i>	
Hyperflexibility	62

Physical findings in trisomy 21 children and adults but not newborns.

(Based on combined data of J Oster, Mongolism, Danish Science Press, Copenhagen; and G Domino and D Newman, Am J Ment Def 69:541, 1964.)

Table 1.

Feature	Percent
Hypotonia	80
Poor Moro reflex	85
Hyperextensibility of joints	80
Excess skin on back of neck	80
Flat facial profile	90
Slanted palpebral fissures	80
Anomalous auricles	60
Dysplasia of pelvis	70
Brachymesophalangy of fifth finger	60
Single palmar crease	45

DISCUSSION

Trisomy 21 is the most common and best known of all malformation syndromes. In 1866, Langdon Down (107) described a condition that he named “mongolian idiocy.” A description of the syndrome also appeared in the works of S’eguin (150), who called the condition “furfuraceous cretinism” as early as 1846. Lejeune (109) demonstrated in 1959 that the condition was associated with an extra G group chromosome; in 1960, Polani et al (133) reported translocation-type Down syndrome; and Clarke et al (28) observed mosaicism for an extra G group chromosome in 1961.[3]

The birth prevalence of trisomy 21 syndrome is generally stated to be 1:650 live births, but it is known to vary in different populations from 1:600 to 1:2000 live births.[4]

Causes of Down Syndrome:[5]

Caused by a meiotic non-disjunction event (95% Cases)

→FIGURE : 4

Non-disjunction → chromosomes fail to separate normally resulting in a gain or loss of chromosomes

1. Meiosis I 2. Meiosis II 3. Fertilization 4. Zygote
2. Left image - blue arrow – non-disjunction taking place during meiosis II
3. Right image - green arrow - non-disjunction taking place during meiosis I

Translocation : (3% Cases) → FIGURE : 5

- Extra chromosome 21 material that causes Down syndrome may be due to a Robertsonian translocation
- Long arm of chromosome 21 is attached to the long arm of another chromosome , often chromosome 14

Mosaicism:(2% Cases)

- Mosaic Down syndrome is when some of the cells in the body are normal and some cells have trisomy 21, an arrangement called a mosaic

Clinical Diagnostic Features:

- Hall’s ten cardinal features of trisomy 21 syndrome in the newborn[6] (Table -1) .
- 100% have at least four features and 89% have six or more features.(Based on B Hall, ActaPaediatrScand (Suppl) 154:1, 1964.)

Medical conditions associated with Down syndrome:

Growth and skeletal abnormalities -:

Both prenatal and postnatal growth deficiency are evident in Down syndrome. The average length is 2–3 cm less and average weight is 400g less than for normal infants. There is also a tendency toward premature birth. Bone age is normal to advanced at birth and thereafter slows down so that by 3 years of age, osseous maturation is significantly delayed. Among the most characteristic

skeletal findings are flaring of the iliac wings and brachymesophalangy of the fifth fingers.[7,8]

Central nervous system and performance -:

Fetal brain growth is clearly delayed, so that infants commonly are microcephalic at birth.[9] Neuropathologic examination has demonstrated that the cerebellum and certain nuclei in the brain stem appear to be smaller than normal. Specific deficits have been documented in certain areas, such as auditory sequencing,[10] color retention , short-term memory, articulation, visual–motor task, ability to differentiate between symbols, and language development.[11]

Dental and Craniofacial manifestations -:

Brachycephaly and flat occiput result in a cephalic index that is usually >0.80.[12] Fontanels are large, and closure is late,[13] a “third fontanel” was noted in all affected patients. Frontal and sphenoidal sinuses are absent and maxillary sinuses are hypoplastic in over 90% of cases.[14] Bony midface hypoplasia produces ocular hypotelorism, a small nose with flattening of the nasal bridge, and relative mandibular prognathism.[15]

Parotid salivary flow rate is decreased. A significant rise in pH, sodium, calcium, bicarbonate, uric acid, and nonspecific esterase in pure parotid saliva has been reported.[16] Periodontal disease has been observed in over 90% of cases. Severe involvement even below the age of 6 years is particularly common in the mandibular anterior and maxillary molar regions. Necrotizing ulcerative gingivitis has been reported to occur in about 30% of patients.[17]

Eruption of both deciduous and permanent teeth is delayed in 75% of cases. An irregular sequence of eruption is common, deciduous first molars sometimes preceding incisors.[18] Missing teeth in 23%–47% of patients. Third molars, second premolars, and lateral incisors are most frequently absent in the permanent dentition. In 12%–17% of patients, deciduous lateral incisors are absent. Peg-shaped maxillary lateral incisors have been observed in 10%. Extreme hypodontia and anodontia noted occasionally.[19]

Crown-size asymmetry,[20] fusion of a deciduous mandibular lateral incisor with a canine or, less commonly, with a central incisor is a low-frequency finding.

Enamel hypoplasia and enamel hypocalcification noted. Jaspers indicated that taurodontism occurs.[21] Irregular alignment of teeth is common. Posterior crossbite, mandibular overjet, mesiocclusion, anterior open bite, crowded teeth, and widely spaced teeth.

Cardiovascular system -:

Atrio ventricular communis occurs in one third of down syndrome patients with congenital heart defects. Approximately one-fourth are either tetralogy of Fallot

(7%), atrial septal defect (10%), or patent ductus arteriosus (3%). Transposition of the great vessels and coarctation of the aorta occur less frequently.[22,23]

Gastrointestinal system :-

Gastrointestinal malformations occur in 10%–18% of cases. Findings include tracheoesophageal fistula, pyloric stenosis, duodenal atresia, annular pancreas, Hirschsprung's disease, and imperforate anus.[24,25]

Skin :-

Dermatologic features include palmoplantar hyperkeratosis (40.8%), xerosis (9.8%), and seborrheic dermatitis (30.9%).

Hematologic system :-

Congenital hematologic disorders are common in Down syndrome. usually newborns, have had transient, severe disorders of hematopoiesis simulating leukemia but with full recovery.

Tumors :-

Shows a 20-fold excess of leukemias and some excess in lymphomas, gonadal and extragonadal germ cell tumors, and possibly retinoblastomas and pancreatic and bone tumors.[26]

LATERAL CEPHALOGRAM :

Platybasia, revealed by a cranial base angle that was more obtuse by 10° and a relatively inferior position of the sella. The alveolar heights of their maxilla and mandible were reduced, mandibular ramus, body, and symphyseal dimensions were smaller. More proclined and under-erupted maxillary incisors and lower incisors promoted an anterior open bite, forward rotation patterns of their maxillary and mandibular planes led to overclosure and promoted the relative mandibular prognathism.[27]

LABORATORY AIDS :

Chromosome study is necessary to confirm all cases. Amniocentesis or chorionic villus biopsy can be offered to all mothers with a previous history of having a child with Down syndrome, to older mothers, and to translocation carriers. Pelvic radiograph is sometimes diagnostically useful in suspected cases. There are low levels of AFP in maternal serum and amniotic fluid in trisomy 21.[28,29]

SCREENING :[30]

Assessment of risk by combining **maternal age**, **fetal nuchal translucency**, and **invasive testing** in 5% of the pregnant population with the highest risk would identify about 80% of trisomy 21 pregnancies.

- Predictive value of triple screening :
 - Maternal serum α -fetoprotein, (AFP)
 - Human chorionic gonadotropin (hcg)

- Unconjugated estriol (ue3)

DENTAL MANAGEMENT FOR DOWN SYNDROME PATIENT

The parent's/patient's initial contact with the dental practice allows both parties an opportunity to address the child's primary oral health needs and to confirm the appropriateness of scheduling an appointment with that particular practitioner.

First appointments should be for orientation only, developmentally-appropriate communication is critical and subsequent appointments may require a little more time than what is usually allowed. Familiarity with the patient's medical history is essential to decreasing the risk of aggravating a medical condition while rendering dental care. The team of dental professionals should develop an individualized oral hygiene program that takes into account the unique disability of the patient. Brushing with a fluoridated dentifrice twice daily should be emphasized to help prevent caries and gingivitis. Toothbrushes can be modified to enable individuals with physical disabilities to brush their own teeth. Electric toothbrushes and floss holders may improve patient compliance.[31]

Sealants reduce the risk of caries in susceptible pits and fissures of primary and permanent teeth. Topical fluorides may be indicated when caries risk is increased. Interim therapeutic restoration (ITR), using materials such as glass ionomers that release fluoride, may be useful as both preventive and therapeutic approaches in patients with down syndrome.[32]

On the opposite end of the spectrum from caries is the high rate of periodontal disease seen in Down syndrome (Shapira, Stabholtz, Schurr, Sela, & Mann, 1991).

The teeth most affected are the mandibular incisors and maxillary molars. Good oral hygiene and semi-annual prophylaxis appointments may not be enough to prevent the progression of periodontal disease in these patients. Early, aggressive treatment is needed. These patients may need to be seen as often as every three months for scaling and root planing and may also benefit from the use of chlorhexidine mouth rinse and possibly systemic antibiotic therapy (Stabholtz, Shapira, Shur, Friedman, Guberman, et al., 1991).

Functional orthodontic treatment such as palatal expansion with a removable appliance combined with Oromotor therapy can be done.

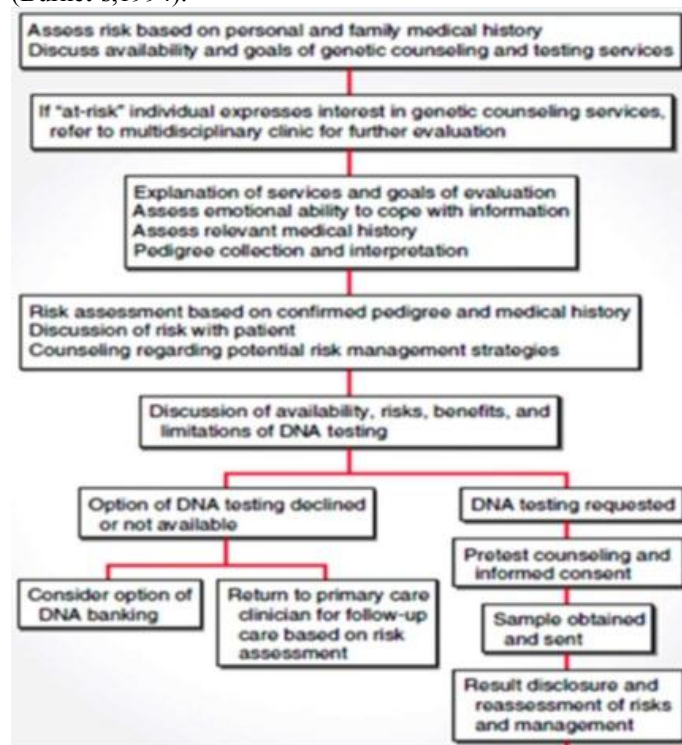
Protective stabilization can be helpful in patients for whom traditional behaviour guidance techniques are not adequate. When protective stabilization is not feasible or effective, sedation or general anesthesia is the behavioural guidance armamentarium of choice.

Treating the older patient with down syndrome may present a different set of problems. There appears to

be a high incidence of early onset Alzheimer's disease in persons with Down syndrome.[33]

Children with DS exhibit Atlanto-axial Instability and extreme care is needed during intubation and orientation of the head by the paediatric dentist during provision of dental treatment under general anaesthesia. It is also difficult to do endotracheal intubations due to a large protruberant tongue, high arched palate, small mouth, short, broad neck, abnormal dentition, small maxilla & mandible, large tonsils. Due to laryngeal atresia, congenital sub-glottic stenosis; poses problems for even general anaesthesia, 2-3 mm endotracheal tubes are used. Genetic counseling must be given to married couple to prevent consanguineous marriages.[34]

The chart given below has the protocol to be followed (Burket's,1994).



REFERENCES

1. Down syndrome. A review for dental professionals., Southern Association Of Institutional Dentists — Self-Study Course Module 3.
2. Antonarakis SE, Lyle R, Dermitzakis ET, Reymond A, Deutsch S. Chromosome 21 and downsindrome: from genomics to pathophysiology. *Nat Rev Genet*, 5(10), 2004, 725-38
3. Robert J, Gorlin M, Michael Cohenjr DMD, Raoul CM, Hennekam. Syndromes of the Head and Neck.
4. Graham RJ, Wachendorf MT, Burns JP, Mancuso TJ. Successful and safe delivery of anesthesia and perioperative care for children with complex special health care needs. *J ClinAnesth*, 21, 2009, 165e72.
5. Stephanie L. Sherman, Emily G. Allen, Lora H. Bean, and Sallie B. Freeman Department of Human Genetics, Emory University School of Medicine, Atlanta, Georgia., Epidemiology of Down Syndrome., *Mental Retardation And Developmental Disabilities Research Reviews*, 13, 2007, 221 – 227.
6. Hall B: Mongolism in newborns: A clinical and cytogenetic study. *ActaPaediatrScand*, (Suppl) 154, 1964, 1–95.
7. Dasgupta NR et al. Validation of radiographic criteria for the diagnosis of Down syndrome in stillborn infants. *Am J Med Genet*, 82, 1997, 347–350.
8. Kjaer MS et al. Hand development in trisomy 21. *AmJ Med Genet*, 79, 1998, 337– 342.

RECENT ADVANCES IN THERAPY AND FUTURE PROSPECTS

Recent interest in therapy for people with DS has focused on pharmacological treatment to enhance cognition. A number of compounds have been shown to improve learning in the Ts65Dn mouse model, such as picrotoxin or pentylenetetrazole, non-competitive N-methyl-D-aspartic acid receptor (NMDAR) antagonist, memantine. To develop new therapeutic targets, it is necessary to determine the identity of genes that contribute to DS phenotypes. This can be facilitated by a carefully designed and curated biobank of detailed phenotypic data alongside DNA and tissue samples from participating individuals.

DS was once thought to be an intractable condition because of the genetic complexity underlying it. Here, we have described recently reported progress in the understanding of human chromosome (Hsa21) trisomy, proclaiming that research efforts in this field are making significant strides to understand and to develop treatments for the debilitating aspects of the syndrome.[35,36]

CONCLUSION:

DS individuals are basically a group of patients requiring special oral health care services. DS care providers should acquire appropriate level of oral health awareness and communities can consider improving accessibility of DS subjects to oral health care in order to assist maintenance of oral and overall health for this group of special need patients.

ACKNOWLEDGEMENT

We are grateful to Department of Oral Medicine and Radiology for continuous support on this research.

DISCLOSURE

The authors deny any conflict of interest

9. Benda CE: Down's Syndrome. Mongolism and Its Management. Grune & Stratton, New York, 1969.
10. Dodd B: Recognition and reproduction of words by Down's syndrome and non-Down's syndrome retarded children. *Am J MentDefic*, 80, 1975, 306-311.
11. Machay DN, McDonald G: The effects of varying digit message structures on their recall by mongols and non-mongolsubnormals. *J MentDefic Res*, 20, 1976, 191-197.
12. Roche AF et al: Growth changes in the mongoloid head. *ActaPaediatrScand*, 50, 1961, 133-140.
13. Smith GF, Berg JM: Down's Anomaly. Churchill Livingstone, Edinburgh, 1976.
14. Jensen GM: Dentoalveolar morphology and developmental changes in Down's syndrome. *Am J Orthodont*, 64, 1973, 607-618.
15. Brown RH, Cunningham WM. Some dental manifestations of mongolism. *Oral Surg* 14, 1961, 664-676.
16. CohenMMSr, Cohen MM Jr. The oral manifestations of trisomyG(Down's syndrome). *Birth Defects*, 7(7), 1971, 241-251.
17. Cohen MM et al. Oral aspects of mongolism. Periodontal disease in mongolism. *Oral Surg*, 14, 1961, 92-107.
18. Jensen GM. Dentoalveolar morphology and developmental changes in Down's syndrome. *Am J Orthodont* 64:607-618, 1973
19. Russell BG, Kjaer I. Tooth agenesis in Down syndrome. *Am J Med Genet*, 55, 1995, 466-471.
20. Garn SM et al. Increased crown-size asymmetry in trisomy G. *J Dent Res*, 49, 1970, 464.
21. Cohen MM, Winer RA. Dental and facial characteristics in Down's syndrome (mongolism). *J Dent Res*, 44, 1965, 197-208.
22. Carter CO. A life table for mongols with the cause of death. *J Ment Defic Res*, 2, 1958, 64-74.
23. Chi TPL, Krovetz L: The pulmonary vascular bed in children with Down syndrome. *J Pediatr*, 86, 1975, 533-538.
24. K'all'en B et al: Major congenital malformations in Down syndrome. *Am J Med Genet*, 65, 1996, 160-166.
25. Knox GE, ten Bensel RW. Gastrointestinal malformations in Down's syndrome. *Minn Med*, 55, 1972, 542-544.
26. Satg'e D et al. A tumor profile in Down syndrome. *Am J Med Genet*, 78, 1998, 207-216.
27. VeerasathpurushAllareddy, Nicholas Ching, Eric A. Macklin, Lauren Voelz, Gil Weintraub, Emily Davidson, Lisa Albers Prock, Dennis Rosen, Richard Brunn and Brian G. Skotko., Craniofacial features as assessed by lateral cephalometric measurements in children with Down syndrome.
28. Ashwood ER et al: Maternal serum alpha-fetoprotein and fetal trisomy 21 in women 35 years and older: Implications for alpha-fetoprotein screening programs. *Am J Med Genet*, 26, 1987, 531-540.
29. Urioste M et al: Holoprosencephaly and trisomy 21 in a child born to a nondiabetic mother. *Am J Med Genet*, 30, 1988, 925-928.
30. Tanski S et al. Predictive value of the triple screening test for the phenotype of Down syndrome. *Am J Med Genet*, 85, 1999, 123-126.
31. Dorothy Helen Boyd, Andrew N Quick, Colleen Murray. The Down syndrome patient in dental practice, Part II: Clinical considerations. *The New Zealand dental journal*, 2004.
32. Guideline on Management of Dental Patients with Special Health Care Needs., Reference Manual V 37 / No 6 15 / 16.
33. Elizabeth S. Pilcher., Medical University of South Carolina., Dental Care For The Patient With Down Syndrome. *Down Syndrome Research and Practice*, 5(3), 111 - 116.
34. Ronald HW, Cheng Cynthia KY, Yiu and W. Keung Leung *Faculty of Dentistry, The University of Hong KongChina.*, Oral Health in Individuals with Down Syndrome. Prenatal Diagnosis and Screening for Down Syndrome.
35. Costa AC, Scott-McKean JJ and Stasko MR. Acute injections of the NMDA receptor antagonist memantine rescue performance deficits of the Ts65Dn mouse model of Down syndrome on a fear conditioning test. *Neuropsychopharmacology*, 33, 2008, 1624-1632.
36. Frances K. Wiseman, Kate A. Alford, Victor L.J. Tybulewicz and Elizabeth MC. Fisher. Down syndrome—recent progress and future Prospects. *Human Molecular Genetics*, 18(1), 2009.

Cite this article:

Saraswathi Gopal K, Sowmya Hemanthakumar. Down Syndrome: Report Of A Case And Review Of Literature. *International Journal Of Advances In Case Reports*, 4(7), 2017, 238-244. DOI: <http://dx.doi.org/10.21276/ijacr.2017.4.7.4>



Attribution-NonCommercial-NoDerivatives 4.0 International