|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Author | Individual | Country | Age(years)a | Sexb | Clinical remarks  | Cytopenias  | Immunoglobulins | Bone marrow | Treatment | Outcome  |
| Boztug,2009 | P1 | Turkish | 6 | M | ASDCryptorchidismIncreased venous markingHepatoesplenomegaly | ANC 60-246 /μlIntermittent thrombocytopenia | NA | Maturation arrest at the stage of promyelocytes/myelocytes | G-CSFCardiac surgery | Alive |
| Boztug,2009 | P2 | Turkish | 3 | F | Cor triatriatumMalformation of pulmonary veins Increased venous markingHepato/esplenomegalyGrowth hormone deficiency | ANC 54-240/μl | NA | Maturation arrest at the stage of promyelocytes/myelocytes | G-CSFCardiac surgery | Alive |
| Boztug,2009 | P3 | Turkish | 11 | F | ASDMitral insufficiencyIncreased venous markingHepatoesplenomegaly | ANC 0-61/μlIntermittent thrombocytopenia  | NA | Maturation arrest at the stage of promyelocytes/myelocytes | G-CSFAwaiting cardiac correction | Alive |
| Boztug,2009 | P4 | Turkish | 6 | M | ASDCryptorchidismIncreased venous marking | ANC 0-322/μl | NA | Maturation arrest at the stage of promyelocytes/myelocytes | G-CSFCardiac surgery | Alive |
| Boztug,2009 | P5 | Turkish | 4 | M | Increased venous markingPoor growth | ANC 25-84/μlIntermittent thrombocytopenia  | NA | Maturation arrest at the stage of promyelocytes/myelocytes | G-CSF | Alive |
| Botzug,2009 | P6 | Turkish | 6 | F | ASDPulmonary valve stenosis Increased venous marking  | ANC 90-612/μl | NA | NA | G-CSF | Alive |
| Boztug,2009 | P7 | Greece  | 7 | F | Inner ear hearing lossIncreased venous marking  | ANC 30-1280/μl | NA | NA | G-CSF | Alive |
| Boztug,2009 | P8 | Germany | 8 | F | ASDUrachal fistula MicrocephalyIncreased venous marking  | ANC 75-210/μlIntermittent thrombocytopenia | NA | NA | G-CSFCardiac surgery | Alive |
| Boztug,2009 | P9 | France  | 9 | F | MyopathyIncreased venous marking  | ANC 200-500/μl | NA | NA | G-CSF  | Alive  |
| Boztug,2009 | P10 | Germany | 10 | M | ASDCryptorchidismGenital dysplasia Microcephaly Inner ear hearing lossIncreased venous markingGrowth retardation | ANC 0-3.000/μlIntermittent thrombocytopenia  | NA | NA | G-CSF Cardiac surgery | Alive |
| Boztug,2009 | P11 | Persian | 11 | M | ASDPDA | ANC 250-440/μl | NA | NA | G-CSF | Alive |
| Boztug,2009 | P12 | Lebanese  | 12 | M | CryptorchidismBilateral inguinal herniaCleft palate  | ANC 615-2000/μl  | NA | NA | G-CSF | Alive |
| Eghbali,2009 | P13 | Iran | 0 | M | Hydronephrosis of the left kidneyASD and PDA  | ANC 234/μl | IgG 672 mg/dl(350-1180)IgM 131 ml/dlIgA 48 mg/dl(36-165) | Maturation arrest in myeloid series | G-CSF  | Alive |
| Dursun,2009 | P14 | Turkish | 0.3 | F | ASDMild PHHypertelorismPectus carinatumHypoplastic thymus  | ANC 300-630/μlALC 336-3800/μlPlatelets 141.000 - 222.000/μlHb 6.5 g/dl | NA | Hypocellularity with normal distribution of all series  | NA | Deceased |
| Durson,2009 | P15 | Turkish | 0.2 | M | ASDMild PHPectus carinatumCryptorchidismHypoplastic thymus  | ANC 112-6000/μlALC 154-3680/μlPlatelets 35.000-446.000/μlHb 7.8 g/dl | NA | Dysplastic changes in all lineages, megaloblastic changes in myeloid and erythroid cell lines, severe vacuolization in myeloid series. | G-CSF 10 mcg/kg/day  | Deceased |
| Arostegui,2009 | P16 | Moroccan | 22 | M | ASDBilateral cryptorchidismProminent subcutaneous venous circulationPoor growth | ANC 50-540/μlHb 9.5 g/dL | NA | Paucity of granulocyte series beyond the promyelocyte stage  | rhG-CSF 7.5 mcg/kg every 48h | NA |
| Xia,2009 | P17 | USA | NA | NA | ASD | NeutropeniaIntermittent thrombocytopenia  | NA | NA | NA | NA |
| Xia,2009 | P18 | USA | NA | NA | ASDCoronary aneurysm | Intermittent thrombocytopenia | NA | NA | NA | NA |
| McDermott,2010 | P19 | USA(Caucasian) | 13 | M | Permeable foramen ovale Mild PHTCryptorchidismProminent superficial veins Sensorineural hearing loss Heart valve abnormalities Poor growthMicrocephalyLigamentous laxityBronchiectasias  | ANC 50-900/μl | NA | Full myeloid maturationIncreased expression of CXCR4 | G-CSF 5 mcg/kg/day | Alive |
| McDermott,2010 | P20 | USA(Caucasian) | 9 | F | ASDProminent superficial veins Poor growthMicrocephalySensorineural hearing loss Bronchiectasias | ANC 50-900/μl | NA | Full myeloid maturationIncreased expression of CXCR4 | G-CSF 5 mcg/kg/day | Alive |
| Germeshausen,2010 | P21 | Turkish | 24 | F | Hypogonadotropic hypogonadismASDMild mitral and tricuspid insufficiencyProminent superficial venous patternLearning difficulties | ANC 200-700 /μlThrombocytopenia | NA | NA | NA | Alive |
| Germeshausen,2010 | P22 | Caucasian | 20 | M | CryptorchidismGenital dysplasiaMicrocephalyASDProminent superficial venous pattern  | ANC 0-30/μlThrombocytopenia  | Hypogammaglobulinemia | NA | NA | NA |
| Germeshausen,2010 | P23 | Caucasian | 5 | M | Neurodevelopmental abnormalities | ANC 300-350 /μl | NA | NA | NA |  |
| Hayee,2011 | P24 | Pakistan | 20 | M | Recurrent oral ulceration | NA | NA | Normocellular with mild left-sided shift | NA | NA |
| Hayee,2011 | P25 | Pakistan | 28 | M | ASDGranulomatous IBDSplenomegalyDigital cubbingShort stature  | NA | NA | NA | NA | NA |
| Gatti,2011 | P26 | Ecuador  | 10 | M | ASDMitral and tricuspid regurgitationSensorineural hearing loss Right-sided cryptorchidismProminent venous pattern | ANC 180/μlPlatelets 18.000/μlHb 9.6 g/dL | NA | Paucity of mature neutrophils, megakaryocyte hyperplasia | G-CSF 1.7 mcg/kg/day | Alive  |
| Cullinane,2011 | P27 | USA(Caucasian) | 32 | F | ASDOculocutaneous albinismIBDFine telangiectasias on arms and chestProminent superficial venous pattern on legs, varicose veins in legsPH | ANC 0/μlPlatelets 21.000-57.000/μl | NA | Arrested neutrophil development, granulocytic precursors markedly increased | G-CSF | NA |
| Banka,2011 | P28 | Israel  | 29 | F | Small for gestation at birthMild learning disabilityProminent superficial venous pattern and varicose veinsMild kyphosisClinodactylyHypothyroidism | ANC 700-1.300/μlPlatelets 38.000-140.000/μl | NA | Hypercellular marrow with myeloid hyperplasia. Increased number of megakaryocytes and blast-like forms | NA | Alive |
| Banka,2011 | P29 | Israel | 26 | M | Small for gestation at birthAgenesis of left kidneyRight kidney hydronephrosisMild learning disabilityProminent superficial venous pattern and varicose veinsHypothyroidism | ANC 200-600/μlHb 9.9 gr/dL | NA | Mildly decreased myeloid cells.Increased megakaryocytes. | NA | Alive |
| Banka,2011 | P30 | Israel | 25 | F | ASDPDAMild learning disabilityProminent superficial venous pattern and varicose veinsPoor growthDelayed menarche | ANC200-1.500/μlALC 900-1.700/μlHb 10.8 gr/dL | NA | Decreased erythropoiesis, dysmyelopoetic changes with reduced granules in the cytoplasm and increased megakaryocytes | NA | Deceased |
| Banka,2011 | P31 | Israel | 2 | M | Pulmonary valve stenosisASD and PDA CryptorchidismMild-moderate development delayProminent superficial venous patternPectus carinatumPH | ANC 400-7.700/μlMonocytosis Lymphopenia | NA | All stages of myelopoesis seen withput any myeloid maturation arrest | NA | Alive |
| Alizadeh,2011 | P32 | Persian | 0.2 | M | ASDFailure to thrive | ANC 40-170 /μl |  | Maturation arrest in myelocyte stage | G-CSF 5-10 mcg/kg/day | Deceased |
| Alizadeh,2011 | P33 | Persian | 4 | M | ASDUnilateral hydronephrosis Prominent superficial venous pattern | ANC 28-450 /μl | NA | Maturation arrest in myelocyte stage | G-CSF 3-5 mcg/kg two times per week | Alive |
| Fernandez,2012 | P34 | USA(Caucasian) | 20 | M | ASDCryptorchidismOculocutaneous albinismMitral valve prolapseInflammatory bowel diseaseHepato/esplenomegaly | Intermittent thrombocytopenia Neutropenia  | NA | NA | G-CSF | Deceased |
| Smith,2012 | P35 | Pakistan | 9 | M | ASDIBDSplenomegalyShort stature | ANC 100/μl | NA | NA | G-CSF | Alive  |
| Smith,2012 | P36 | Turkey  | NA | F | Patent foramen ovaleTricuspid insufficiency | ANC<100/μl | NA | NA | G-CSF | Alive |
| Smith,2012 | P37 | Pakistan | 13 | M | No abnormalities  | ANC 400 /μl | NA | Normocellular morphology | G-CSF | Alive |
| Smith,2012 | P38 | Pakistan | 3 | M | No abnormalities  | ANC 450 /μl | NA | Normocellular morphology  | G-CSF | Alive  |
| Boztug,2012 | P39 | Arab  | 12 | F | ASDSmall PDAProminent superficial venous patternDiscontinuous labia majora and minora | ANC 200/μlPlatelets 58.000-414.000/μl | NA | Left shift myelopoiesis, reduced numbers of mature neutrophils | G-CSF 5 mcg/kg alternate days  | Alive |
| Boztug,2012 | P40 | Hispanic | 9 | M | ASDProminent superficial venous patternFrontal bossingUpturned noseBilateral cryptorchidismGrowth hormone deficiency | ANC 0-123/μlPlatelets 13.000-120.000/μl | NA | Left shift myelopoiesis, reduced numbers of mature neutrophils | G-CSF 3.3 mcg/kg three times per week | Alive |
| Boztug,2012 | P41 | Caucasian | 9 | M | ASDProminent superficial venous patternHypoplastic nipplesMicropenisErythropachydermia | ANC 100/μl | NA | Not done  | G-CSF 3.7 mcg/kg three times per week | Alive |
| Boztug,2012 | P42 | Caucasian | 11 | M | ASDPDABicuspid aortic valveProminent superficial venous patternMicropenisCryptorchidismErythropachydermiaMild developmental delay  | ANC 276/μlPlatelets 44.000-342.000/μl | NA | Left shift myelopoiesis, reduced numbers of mature neutrophils | G-CSF 5 mcg/kg three times per week | Alive  |
| Boztug,2012 | P43 | Caucasian | 7 | M | ASDProminent superficial venous patternGrowth hormone deficiencyTriangular face Left inguinal hernia  | ANC 0-2.200/μlPlatelets 65.000-635.000/μl | NA | Hypocellular bone marrow, left shift of granulopoiesis with few mature neutrophils | Without G-CSF supplementation | Alive  |
| Boztug,2012 | P44 | Hispanic  | 11 | M | ASDMitral and tricuspid regurgitationProminent superficial venous patternRight cryptorchidismBilateral inner ear hearing loss | ANC 180/μl Platelets 16.000-553.000/μl | NA | Maturation arrest at myelocyte/promyelocyte stage  | NA | Alive  |
| Boztug,2012 | P45 | Hispanic  | 1 | M | ASDProminent superficial venous patternAmbiguous genitaliaHydronephrosisTriangular face  | ANC 40/μl | NA | Maturation arrest at myelocyte/promyelocyte stage | G-CSF 4 mcg/kg alternate days | Alive  |
| Boztug,2012 | P46 | Caucasian | 16 | F | ASDProminent superficial venous pattern | ANC 300/μl |  | NA | G-CSF 5 mcg once weekly | Alive  |
| Boztug,2012 | P47 | Persian | 11 | F | ASDMild tricuspid regurgitation*Cutis laxa*Growth retardationTriangular face  | ANC 220/μlPlatelets 69.000-173.000/μl | NA | Maturation arrest at myelocyte/promyelocyte stage | G-CSF 5 mcg/kg once weekly | Alive |
| Boztug,2012 | P48 | Hispanic | 12 | F | Small ASDProminent superficial venous patternGrowth hormone deficiencyTriangular face | ANC 480/μlPlatelets 25.000-362.000/μl | NA | Maturation arrest at myelocyte/promyelocyte stage | G-CSF 8 mcg/kg alternate days | Alive |
| Boztug,2012 | P49 | Hispanic | 14 | M | ASDProminent superficial venous patternTriangular face OsteoporosisKawasaki diseaseGrowth retardation Delayed puberty  | ANC 60/μlPlatelets 30.000-420.000/μl | NA | Maturation arrest at myelocyte/promyelocyte stage | G-CSF 14 mcg/kg/day | Alive  |
| Boztug,2012 | P50 | Turkish | 0 | M | ASDProminent superficial venous patternHydronephrosis*Cutis laxa*Triangular faceFrontal bossing Micrognathia Bilateral hearing loss Growth retardation | ANC 41/μl | NA | Maturation arrest at myelocyte/promyelocyte stage | G-CSF 7 mcg/kg/day | Alive |
| Boztug,2012 | P51 | Persian | 1 | M | ASDProminent superficial venous pattern | ANC 750-900/μl | NA | Maturation arrest at myelocyte/promyelocyte stage | G-CSF 3 mcg/kg alternate days  | Alive |
| Boztug,2012 | P52 | Caucasian | 18 | M | ASDBicuspid aortic valveProminent superficial venous patternSmall kidneysCryptorchidismDelayed pubertyGrowth retardationMassive splenomegaly | ANC<100/μl | NA  | NA | G-CSF 7.5 mcg/kg alternate days | Alive |
| Boztug,2012 | P53 | Pakistani | 1 | F | Hypoplastic left ventricle Congenital ptosis Growth retardation  | ANC 200-400 | NA | Left shift myelopoiesis, strongly reduced numbers of mature neutrophils  | G-CSF 5 mcg/kg 2 times per week | Alive |
| Boztug,2012 | P54 | Caucasian | 7 | M | ASDProminent superficial venous patternCryptorchidismRight ptosisSplenomegaly | ANC 200/μlPlatelets 97.000-332.000/μl | NA | Left shift myelopoiesis, strongly reduced numbers of mature neutrophils | G-CSF 12 mcg/kg three times per week | Alive  |
| Aytekin, 2013 | P55 | Turkey | 13  | F | Mild mitral regurgitationFrontal bossingDepressed nasal bridgeUpturned noseRetrognathiaProminent superficial venous pattern on neck, chest, abdomenPoorly developed secondary sexual characteristics | Hb 9.2 g/dLANC 200/μl | Normal | MyelokathexisHypercellular marrow with myeloid hyperplasia without maturation arrest | G-CSF 2.5 mcg/kg | Alive  |
| Banka,2013 | P56 | Pakistan | 10 | F | No prominent superficial venousNormal echocardiogram | ANC 320-1.999/μlPlatelets 131.000-201.000/μl | NA | Normocellular marrow | G-CSF 4 mcg/kg | Alive |
| Banka,2013 | P57 | Pakistan | 13 | F | No prominent superficial venousNormal echocardiogram | ANC 280-1080/μl | NA | Normocellular marrow | Prophylactic Co-trimoxazole | Alive |
| Banka,2013 | P58 | GreatBritain  | 8 | F | No prominent superficial venousNormal echocardiogram | ANC 120-570/μlLymphocytes 1070-1100/μl | NA | Normocellular marrow | Prophylactic Co-trimoxazole | Alive |
| Banka,2013 | P59 | GreatBritain | 18 | F | No prominent superficial venousNormal echocardiogram | ANC 110-670/μlLymphocytes 660-1150/μl | NA | Normocellular marrow | Prophylactic Co-trimoxazole | Alive |
| Bégin,2013 | P60 | Canada | 0.6 | F | Mitral valve insufficiencyProminent superficial venousIBDGrowth delay  | ALC 600 /μl(1.500-2.800)T-cell lymphopenia  | IgG 2340 mg/dl(520-1520)IgA 117 mg/dl(65-400)IgM 183 mg/dl(22-280) | Normal hematopoiesis | G-CSG 5 mcg/kgPrednisoneInfliximab | NA |
| Estévez,2013 | P61 | Caucasian | 11 | M | CryptorchidismProminent superficial veins  | ANC 45-1.200 /μlIntermittent thrombocytopenia  | NA |  | G-CSF 5 mcg/kg/day | Alive |
| Alangeri,2013 | P62 | Saudi Arabia | 12 | M | AsthmaBicuspid aortic valve Inguinal hernia  | ANC 7-500/μlIntermittent thrombocytopenia | NA | Active trilineage hematopoiesis, no evidence of granulocytic arrest. | G-CSF | NA |
| Alangeri,2013 | P63 | Saudi Arabia | 10 | F | ASDAphthous stomatitisAbdominal painAsthma | ANC 210/μlIntermittent thrombocytopenia | NA | NA | NA | NA |
| Alangeri,2013 | P64 | Saudi Arabia | NB | M | Septic shock | NA | NA | NA | NA | Deceased |
| Alangeri,2013 | P65 | Saudi Arabia | 9 | F | Asthma | ANC 110-600/μl | Normal lymphocyte subsets | No maturation arrest | NA | NA |
| Alangeri,2013 | P66 | Saudi Arabia | 2 | M | NA | ANC 180/μl  |  | Active granulopoiesis with no maturation arrest | G-CSF | NA |
| Arikoglu, 2014 | P67 | Turkey | 3 | F | ASD and PDAFrontal bossing Depressed nasal bridgeRetrognathiaProminent superficial venous pattern on chest and abdomenHepatomegalyBilateral cortical renal cystsPH | ANC 600/μlHb 6 g/dLPlatelets 89000/μl | IgG 889 mg/dl (604-1940)IgA 50 mg/dl (26-296 mg/dl)IgM 130 mg/dl(71-235)IgE < 17 KU/L (0-100)CD4+ T cells 260-436 mm3 (500-2400)CD19+ T cells 80-166 mm3 (200-2100) | Normocellular marrow  | G-CSF 5 mcg/kg | Alive |
| Kaya,2014 | P68 | Turkey | 0.4 | F | Patent foramen ovale Minimal tricuspid insufficiencyPancolitis, IBD | ANC 80/μl | Normal | Normal | Pegfilgrastim 100 mcg/kg week | Alive |
| Kaya,2014 | P69 | Turkey | 1 | F | ASDOsteoporosis | ANC 100/μl | NA | NA | Pegfilgrastim 100 mcg/kg week | Alive |
| Desplantes,2014 | P70 | France | NB | F | Aortic insufficiencyGrade III RVU, urethral duplicationProminent veins*Cutis laxa*Frontal bossingThick lipsHypothyroidismNeurodevelopment difficultiesLeukemia  | ANC 280/μlMild thrombocytopeniaMild anemia  | NA | NA | HSCT | Alive  |
| Desplantes,2014 | P71 | France | NB | M | ASDBilateral cryptorchidismHypospadiasProminent veins*Cutis laxa* Frontal bossingThick lipsNeurodevelopment difficulties | ANC 383/μl | NA | NA | G-CSF | Deceased |
| Desplantes,2014 | P72 | France | NB | F | ASDBilateral grade I RVU Thick lipsProminent veins *Cutis laxa* Neurodevelopment difficulties | ANC 411/μlMild thrombocytopeniaMild anemia  | NA | NA | G-CSF | Alive |
| Desplantes,2014 | P73 | France | NB | M | PDA overriding aorta Grade III RVURight cryptorchidismProminent veins IBD*Cutis laxa* PHThick lips Neurodevelopment difficulties | ANC 550/μlMild anemia  | NA | NA | NA | Deceased |
| Desplantes,2014 | P74 | France | NB | M | CryptorchidismBilateral RVU Megaureter Prominent veins *Cutis laxa* Bilateral hearing loss Prominent lips Neurodevelopment difficulties | ANC 314/μlMild anemia  | NA | NA | G-CSF | Alive |
| Desplantes,2014 | P75 | France | 0.7 | M | Prominent veins Kabuki syndrome like Cerebral palsy  | ANC 540/μlMild anemia  | IgG 1870 mg/dl (608-1229)IgA 170 mg/dl (33-200)IgM 170 mg/dl (46-197)CD3+ 1960 (2100-6200)CD4+ 812 (1300-3400)CD8+ 756 (490-1300)CD19 364 (390-1400)  | NA | G-CSF | Alive |
| Desplantes,2014 | P76 | France | NB | M | Aortic insufficiency CryptorchidismMicropenis Prominent veins IBD Inguinal hernia  | ANC 405/μlMild thrombocytopeniaMild anemia  | NA | NA | G-CSF steroid | Alive |
| Desplantes,2014 | P77 | France | NB | M | ASD Aortic insufficiencyCryptorchidismProminent veins Umbilical hernia Frontal bossing  | ANC 410/μl | IgG 435 mg/dl (332-1160)IgA 32 mg/dl (14-105)IgM 34 (45-190)CD3+ 1891 (2100-6200)CD4 1178 (1300-3400)CD8 682 (620-2000)CD19 651 (720-2600) | NA | No treatment | Alive |
| Desplantes,2014 | P78 | France | NB | F | Tricuspid regurgitationBilateral RVU Bilateral deafnessNA | ANC 400/μl | NA | NA | No treatment | Alive |
| Desplantes,2014 | P79 | France | 0.7 | F | ASDPHBroad nasal bridge  | ANC 700/μlSevere anemia  | IgG970 mg/dl (768-1630)IgA 170 mg/dl (68-378)IgM 100 mg/dl (60-230)CD3+ 378 (1200-2000)CD4+ 252 (530-1300)CD8+ 98 (330-920)CD19+ 49 (110-570) | NA | G-CSFsteroid | Alive |
| Desplantes,2014 | P80 | France | NB | F | ASDProminent veins  | ANC 520/μlSevere thrombocytopeniaMild anemia  | NA | NA | G-CSF | Alive |
| Desplantes,2014 | P81 | France | 4.5 | M | ASDCryptorchidismProminent veins Delayed puberty | ANC 160/μlMild anemia  | NA | NA | NA | Deceased |
| Desplantes,2014 | P82 | France | NB | M | Prominent veins Pierre Robin sequenceMajor intelectual disability  | ANC 690/μlMild thrombocytopeniaMild anemia  | IgG1560 mg/dl (420-1090)IgA 55 mg/dl (22-157)IgM 70 mg/dl (45-263)CD3+ 698 (1400-3700)CD4+ 274 (700-2200)CD8+ 332 (490-1300)CD19+ 58 (390-1400) |  | G-CSF | Deceased |
| Notarangelo,2014 | P83 | Italy | 13 | F | Mitral valve prolapse Inguinal hernia Hypergonadotrophic hypogonadismFrontal bossingRetrognathia Prominent superficial venous pattern | ANC 200/μlMild anemia Intermittent thrombocytopenia  | IgG 1240 mg/dl (231-947)IgA 54 mg/dl (8-74)IgM 79 (26-210) | Global hypercellularityMyeloid hyperplasia Maturation arrestPaucity of mature neutrophils | G-CSF 5-10 mcg/kg/day | NA |
| Notarangelo,2014 | P84 | Turkey | 2 | M | Facial dysmorphismsProminent veins Sensorineural hearing loss Micropenis Coronal hypospadias | ANC 60/μl | IgG 974 mg/dl (462-1710)IgA 64 mg/dl (27-173)IgM 118 mg/dl (62-257) | Delayed granulocyte maturation | G-CSF 5 mcg/kg 3 times a week | NA |
| Kiykim,2015 | P85 | Turkey | 19 | M | ASDProminent superficial venous patternOsteopenia Puberal delayIBD-likeBronchiectasis | ANC 500/μlALC 400/μl | IgG 2520 mg/dl (913-1884)IgM 89 mg/dl(88-322)IgA 67 mg/dl(139-378)CD4+T cells 124/μl(500-2000)CD8+ T cells 140/μl(200-1200)CD 19+20 cells 20 /μl(64-820)CD16+56 8/μl(100-1200) | Hypercellular bone marrow, mild dysplasia in granulocytic lineage | IVIGTMP-SMXAzathiopurineMesalazineTestosterone | Alive |
| Kiykim,2015 | P86 | Turkey | 11 | F | ASD and PDAOsteoporosis Prominent superficial venous patternBronchiectasis | ANC 300/μlALC 1400/μl | IgG 2000 mg/dl(835-2894)IgM 237 mg/dl(47-484)IgA 56 mg/dl(67-433) | Hypercellular bone marrow: left shift in granulopoiesis. Mild dysplasia in granulocytic lineage.  | IVIGG-CSFTMP-SMX | Alive |
| Kiykim,2015 | P87 | Turkey | 16 | F | Mild mitral valve insufficiencyOsteoporosis Pubertal delayBronchiectasis | ANC 340/μlALC 1700/μlCD19+20 85/μl(120-740) | IgG 1930 mg/dl(676-2197)IgM 98 mg/dl(75-448)IgA 53 mg/dl(108-447) | Mild dysplasia in granulocytic lineage.Hyposegmented neutrophils and hypogranulation | IVIGTMP-SMX | Alive |
| Mistry,2017 | P88 | GreatBritain | 12 | M | ArthritisIBD-like  | Cyclic neutropenia Normocytic anemia  | Polyclonal increase in IgG and IgM | No defect in neutrophil production or maturation | Adalimumab | Alive |
| Bolton,2019 | P89 | Great Britain | 1.4 | M | IBD | Neutropenia ALC 490/μl | IgG 1660 mg/dl(660-1.200) | NA | G-CSF for the first 20 years of life HSCT | Alive |
| Case 1 (this report) | P90 | México | 0.3 | M | Low weightPersistent foramen ovale PHBilateral hydronephrosisProminent superficial veins in thorax, abdomen and limbsHepatomegalyCryptorchidismVelopalatal insufficiencyBilateral sensorineural hearing loss | ANC 100-800/μlIntermittent thrombocytopenia ALC 1400 /μl | IgG 398 mg/dl(290-550)IgM 114 mg/dl(30-85)IgA 44 mg/dl(30-85) | Hypocellularity and maturation arrest of the myeloid development  | G-CSF 5-22 mcg/kg/dayHSCT | Deceased |
| Case 2(this report) | P91 | México | 15 | F | Bilateral sensorineural hearing lossIBDPHProminent superficial veins Mild tricuspid insufficiencyPuberal delay  | Intermittent neutropenia, nadir with 400 /μlALC 1000 /μl | IgG 396 mg/dl(660-1220)IgA mg/dl(56-203)IgM 77 mg/dl(57-162)IgE 36.6 mg/dl |  | G-CSF 10 mcg/kg/day MesalazinTMP-SMXPrednisoneIVIG every 21 days  | Deceased |
| Case 3(this report) | P92 | México | 0.3 | F | ASD and PDA Tricuspid insufficiencyProminent superficial veins Bilateral sensorineural hearing lossSevere pulmonary damage PH | ANC 200 /μlALC 1300 /μl | IgG 2230 mg/dl(240-440)IgA 341 mg/dl27-86)IgM 77 mg/dl(34-114) | Hypocellularity | G-CSF 30 mcg/kg/dayTMP-SMXIVIG every 21 days  | Alive |
| Case 4 (this report) | P93 | México | 9 | M | Persistent foramen ovalePHLeft inguinal hernia. Prominent superficial veins Redundant skin folds in neck | ANC 450-790/μlIntermittent lymphopenia and thrombocytopenia | NA | Cell hypoplasia | G-CSF | Alive |
| Case 5 (this report) | P94 | México | 2 | F | Bilateral conductive hearing loss | ANC 100 /μlIntermittent lymphopenia and thrombocytopenia | IgG 918 mg/dl (340-620)IgA 30.8 mg/dl(33-122)IgM 81 mg/dl(48-143) | Hypocellularity | G-CSF 6mcg/kg 4 days/week | Alive |

**Table 1. Demographic, clinical and laboratory features of 94 patients with G6PC3 deficiency**

a. Age at diagnosis or follow up

b. F, female; M, male, NA, not available

ASD, atrial septal defect; Hb, hemoglobin; ANC, absolute neutrophil count; ALC, absolute lymphocyte count; Ig, immunoglobulin; G-CSF, granulocyte colony-stimulating factor; PDA, persistent ductus arteriosus; HSCT, hematopoietic stem cell transplantation; PH, pulmonary hypertension; IVIG intravenous gammaglobulin; TMP-SMX, trimethoprim sulfamethoxazole; NB, newborn; IBD, inflammatory bowel disease

**Table 2. Genetic information of 94 G6PC3 deficient patients**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Author | Individual | Country orethnicity | Genotype  | Protein change | Variant type | Syndromic |
| Boztug,2009 | P1 | Turkey | c.[758G>A]  | p.[Arg253His] | Missense, homozygous | Yes |
| Boztug,2009 | P2 | Turkey | c.[758G>A]  | p.[Arg253His] | Missense, homozygous | Yes |
| Boztug,2009 | P3 | Turkey | c.[758G>A]  | p.[Arg253His] | Missense, homozygous | Yes |
| Boztug,2009 | P4 | Turkey | c.[758G>A]  | p.[Arg253His] | Missense, homozygous | Yes |
| Boztug,2009 | P5 | Turkey | c.[758G>A]  | p.[Arg253His]  | Missense, homozygous | Yes |
| Boztug,2009 | P6 | Turkey | c. [554TT>C]  | p. [Leu185Pro]  | Missense, homozygous | Yes |
| Boztug,2009 | P7 | Greece  | c. [141C>G]  | p. [Tyr47Ter]  | Nonsense, homozygous | Yes |
| Boztug,2009 | P8 | Germany | c. [784G>C]  | p.[Gly260Arg]  | Missense, homozygous | Yes |
| Boztug,2009 | P9 | France | c.[677+1 G>A] + [829C>T] | p. [?] + [Gln277Ter] | Nonsense, comp.het? | Yes |
| Boztug,2009 | P10 | Germany | c. [778G>C]  | p. [Gly260Arg] | Missense, homozygous | Yes |
| Boztug,2009 | P11 | Iran | c. [935dupT]  | p. [Asn313fs]  | Frameshift, homozygous | No |
| Boztug,2009 | P12 | Lebanese | c. [144C>A]  | p. [Tyr48Ter]  | Nonsense, homozygous  | Yes |
| Eghbali,2009 | P13 | Iran | c. [935\_936insT] | p.[Asn313fs] | Insertion/Frameshift, homoz. | Yes |
| Dursun,2009 | P14 | Turkish | c.[346A>C] | p.[Met116Val] | Missense, homozygous | Yes |
| Dursun,2009 | P15 | Turkish | c.[346A>C] | p.[Met116Val] | Missense, homozygous | Yes |
| Arostegui,2009 | P16 | Moroccan | c.[257delA]  | p.[Glu86fs]  | Frameshift, homozygous | Yes |
| Xia, 2009 | P17 | USA | NR | NR | NR | No |
| Xia,2009 | P18 | USA | c.[210delC]  | p.[170fsTer46]  | Frameshift, homozygous | No |
| McDermott,2010 | P19 | USA(Caucasian) | c.[778G>C]  | p. [Gly260Arg]  | Missense, homozygous | Yes |
| McDermott,2010 | P20 | USA(Caucasian) | c.[778G>C]  | p. [Gly260Arg]  | Missense, homozygous | Yes |
| Germeshausen,2010 | P21 | Turkish | c.[347T>A] | p. Met116Lys | Missense, homozygous | Yes |
| Germeshausen,2010 | P22 | Caucasian | c.[778G>C]  | p.[Gly260Arg]  | Missense, homozygous  | Yes |
| Germeshausen,2010 | P23 | Caucasian | NR | p.[Arg189Gln] | Missense, homozygous | No |
| Hayee,2011 | P24 | Pakistan | c.[130C>T] | p.[Pro44Ser] | Missense, homozygous | No |
| Hayee,2011 | P25 | Pakistan  | c.[190\_210del]  | p. [Thr64\_Ile70del]  | Small deletion, homozygous | Yes |
| Gatti,2011 | P26 | Ecuador | c. [765\_delAG] | p.[Ser255fs]  | Small del/Frameshift, homoz. | Yes |
| Cullinane,2011 | P27 | USA(Caucasian) | c.[986delC]  | p.[Thr329ArgfsTer68]  | SN del/Frameshift, homoz. | Yes |
| Banka,2011 | P28 | Israel | c.[758G>A]  | p.[Arg253His]  | Missense, homoz. | Yes |
| Banka,2011 | P29 | Israel | c.[758G>A]  | p.[Arg253His]  | Missense, homoz. | Yes |
| Banka,2011 | P30 | Israel | c.[758G>A]  | p.[Arg253His]  | Missense, homoz. | Yes |
| Banka,2011 | P31 | Israel | c.[758G>A]  | p.[Arg253His]  | Missense, homoz. | Yes |
| Alizadeh,2011 | P32 | Persian | c.[416G>T]  | NR | NR | No |
| Alizadeh,2011 | P33 | Persian  | c. [935dupT]  | p.[Asn313fs]  | Dup/Frameshift, homoz. | Yes |
| Fernandez,2012 | P34 | Canada | c. [829C>T]  | p.[Gln277Ter]  | Nonsense, homozygous | Yes |
| Smith,2012 | P35 | Pakistan | c.[190\_210del] | p.[Thr64\_Ile70del] | In-frame 21bp deletion, homoz. | Yes |
| Smith,2012 | P36 | Turkey | c.[623T>G]  | p.[Leu208Arg]  | Missense, homozygous | No |
| Smith,2012 | P37 | Pakistan | c.[130C>T] | p. [Pro44Ser] | Missense, homozygous | No |
| Smith,2012 | P38 | Pakistan | c.[130C>T] | p. [Pro44Ser] | Missense, homozygous | No |
| Boztug,2012 | P39 | Arab | c.[758G>A]  | p.[Arg253His]  | Missense, homozygous | Yes |
| Boztug,2012 | P40 | Hispanic | c.[218+1G>A] | NR | Splice-site intronic, homoz. | Yes |
| Boztug,2012 | P41 | Caucasian  | c.[758G>C]  | p.[Gly260Arg]  | Missense, homoz. | Yes |
| Boztug,2012 | P42 | Caucasian | c.[758G>C]  | p p.[Gly260Arg]  | Missense , homoz. | Yes |
| Boztug,2012 | P43 | Caucasian | c.[208insC]+[778G>C] | p.[lle70fsTer16]+[Gly260Arg] | SN insertion/frameshift + Missense (comp.het) | Yes |
| Boztug,2012 | P44 | Hispanic | c.[766\_777delAG]  | p.[Ser255fs]  | Frameshift, homozygous | Yes |
| Boztug,2012 | P45 | Hispanic  | c.[210delC]+[348G>A] | p.[lle70fsTer46] + [Met116lle] | Frameshift, homozygous | Yes |
| Boztug,2012 | P46 | Caucasian  | c.[677+1 G>A]+[829>T] | p.[?]+[Gln277Ter] | Splice-site intronic + Nonsense, (Comp.het)  | Yes |
| Boztug,2012 | P47 | Persian | c.[935dupT]  | p. [Asn313fs]  | SN dup/Frameshift, homoz. | Yes |
| Boztug,2012 | P48 | Hispanic  | c.[210deIC]  | p.[Phe71fsTer45]  | SN del/Frameshift, homoz. | Yes |
| Boztug,2012 | P49 | Hispanic | c. [210deIC]  | p. [lle70fsTer4]  | SN del/Frameshift, homoz. | Yes |
| Boztug,2012 | P50 | Turkish | c.[779G>A]  | p.[Gly260Asp]  | Missense, homoz. | Yes |
| Boztug,2012 | P51 | Persian | c.[416G>T]  | p. [Ser139lle] | Missense, homoz. | Yes |
| Boztug,2012 | P52 | Caucasian | c. [482G>A] + [565C>T] | p. [Arg161Gln] + [Arg189Ter] | Missense + Nonsense, comp.het. | Yes |
| Boztug,2012 | P53 | Pakistani | c. [766\_777delAG]  | p. [Ser255fs]  | Small del./Frameshift, homoz. | Yes |
| Boztug,2012 | P54 | White caucasian | c. [131C>T] + [758 G>A] | p. [Pro44Leu]+[Arg253His] | Missense, comp.het. | Yes |
| Aytekin,2013 | P55 | Turkey | c.[461T>C]  | p.[Leu154Pro] | Missense, homozygous | Yes |
| Banka,2013 | P56 | Pakistan | c.[130c>T] | p.[Pro44Ser] | Missense, homozygous | No |
| Banka,2013 | P57 | Pakistan | c.[347T>C] | p.[Met116Thr] | Missense, homozygous | No |
| Banka,2013 | P58 | Great Britain | c.[757C>T]+[1000\_1001] | p.[Arg253Cys] + [Met334fs] | Missense + Small del/Frameshift, comp.het.  | No |
| Banka,2013 | P59 | GreatBritain | c.[757C>T]+[1000\_1001] | p.[Arg253Cys] + [Met334fs] | Missense + Small del/Frameshift, comp.het. | No |
| Bégin,2013 | P60 | Canada | c.[IVS3-1 G>A]+[G778G>C] | p.[?] + [Gly260Arg] | Splice-site intronic + Missense, comp.het. | Yes |
| Estévez,2013 | P61 | Caucasian | c. [778G>C] | p.[Gly260Arg] | Missense, homozygous | Yes |
| Alangeri,2013 | P62 | Saudi Arabia | c.[974 T>G] | p.[Leu325Arg] | Missense, homozygous | No |
| Alangeri,2013 | P63 | Saudi Arabia | c.[974 T>G] | p.[Leu325Arg] | Missense, homozygous | No |
| Alangeri,2013 | P64 | Saudi Arabia | c.[974 T>G] | p.[Leu325Arg] | Missense, homozygous | No |
| Alangeri,2013 | P65 | Saudi Arabia | c.[974 T>G] | p.[Leu325Arg] | Missense, homozygous | No |
| Alangeri,2013 | P66 | Saudi Arabia | c.[974 T>G] | p.[Leu325Arg] | Missense, homozygous | No |
| Arikoglu, 2014 | P67 | Turkey | c.[175T>C]  | p.[Trp59Arg] | Missense, homozygous | Yes |
| Kaya,2014 | P68 | Turkey | c. [623T>C] | p.[Leu208Arg] | Missense, homozygous | No |
| Kaya,2014 | P69 | Turkey | NR | NR | NR | No |
| Desplantes,2014 | P70 | France | c.[249G>A] | p.[Trp83Ter] | Nonsense, homozygous | Yes |
| Desplantes,2014 | P71 | France | c.[249G>A] | p.[Trp83Ter] | Nonsense, homozygous | Yes |
| Desplantes,2014 | P72 | France | c.[249G>A] | p.[Trp83Ter] | Nonsense, homozygous | Yes |
| Desplantes,2014 | P73 | France | c.[249G>A] | p.[Trp83Ter] | Nonsense, homozygous | Yes |
| Desplantes,2014 | P74 | France | c.[249G>A] | p.[Trp83Ter] | Nonsense, homozygous | Yes |
| Desplantes,2014 | P75 | France | c.[758G>A] | p.[Arg253His] | Missense, homozygous | Yes |
| Desplantes,2014 | P76 | France | c.[481C > T] | p.[Arg161Ter] | Nonsense, homozygous | yes |
| Desplantes,2014 | P77 | France | c.[778G > C]  | p.[Gly260Arg] | Missense, homozygous | Yes |
| Desplantes,2014 | P78 | France | c.[778G > C] | p.[Gly260Arg] | Missense, homozygous | Yes |
| Desplantes,2014 | P79 | France | c.[778G > C]  | p.[Gly260Arg] | Missense, homozygous | No |
| Desplantes,2014 | P80 | France | c.[565C > T]  | p.[Arg189Ter] | Nonsense, homozygous | Yes |
| Desplantes,2014 | P81 | France | c.[565C > T]  | p.[Arg189Ter] | Nonsense, homozygous | Yes |
| Desplantes,2014 | P82 | France | c.[565C > T]  | p.[Arg189Ter]  | Nonsense, homozygous | Yes |
| Notarangelo,2014 | P83 | Italy | c.[144C>A]+[373\_375delAAT] | p.[Tyr48Ter]+[Ile125del] | Nonsense + In-frame del, comp.het. | Yes |
| Notarangelo,2014 | P84 | Turkey | c.[680\_684delinsT] | p.[Ser227LeufsTer3] | Indel/Frameshift, homozygous | Yes |
| Kiykim,2015 | P85 | Turkey | c. [535+1G>A] | NR | Splicesite intronic, homozygous | Yes |
| Kiykim,2015 | P86 | Turkey | c. [935dupT] | p. [Asn313fs] | SN dup/frameshift, homoz. | Yes |
| Kiykim,2015 | P87 | Turkey | c. [C394T] | p.[Glu132Ter] | Nonsense, homozygous | Yes |
| Mistry,2017 | P88 | GreatBritain | c. [130C>T] | p.[Pro44Ser] | Missense, homozygous | Yes |
| Bolton,2019 | P89 | GreatBritain  | c.[911dupC] | p.[Gln305fs82Ter] | SN dup/frameshift, homozygous | No |
| C1 (this report) | P90 | México | c.[210delC] | p.[Phe71SerfsTer46] | SN deletion/frameshift, homoz. | Yes |
| C2 (this report) | P91 | México | c.[210delC] | p.[Phe71SerfsTer46] | SN deletion/frameshift, homoz. | Yes |
| C3 (this report) | P92 | México | c.[210delC] | p.[Phe71SerfsTer46] | SN deletion/frameshift, homoz. | Yes |
| C4 (this report) | P93 | México | c.[210del] + c.[481C>T] | p.[Phe71SerfsTer46] + [Arg161Ter] | SN deletion/frameshift + Nonsense (comp.het) | Yes |
| C5 (this report)  | P94 | México | c.[210del] + [421del] | p.[Phe71SerfsTer46] + [Trp141GlyfsTer2] | SN deletion/frameshift, comp.het. | No |

NR, not reported.