

22q11.2 Deletion Syndrome

(DiGeorge Syndrome / Velocardiofacial Syndrome)

A Multisystem Genetic Condition with Cardiac, Immune, Endocrine and Developmental Features



A small missing segment on chromosome 22 at 22q11.2 involves many genes (including TBX1) and leads to a wide range of features.



What is 22q11.2 Deletion Syndrome?

- A genetic disorder caused by loss of a small segment of chromosome 22 at 22q11.2.
- Affects development of the heart, immune system, parathyroid glands, palate and other organ systems.
- Historically called DiGeorge syndrome and velocardiofacial syndrome (VCFS).
- Features are highly variable — no two individuals are the same.



Why Does It Happen?

- Usually a ~3 Mb deletion involving many genes (including TBX1).
- ~90% of cases occur de novo (not inherited).
- When a parent has the deletion, inheritance is autosomal dominant with a 50% chance in each pregnancy.



Key Takeaways

- Features range from major congenital heart disease and immune problems to relatively mild findings.
- Early recognition allows proactive, coordinated care and better outcomes.
- Many individuals grow into adulthood and lead productive lives.



Cardiac Clues: When to Consider Testing

Genetic testing for 22q11.2 deletion should be strongly considered in patients with the following cardiac findings:



- Interrupted aortic arch type B
- Truncus arteriosus
- Tetralogy of Fallot (especially with pulmonary atresia)
- Aortic arch anomalies (including right aortic arch)
- Abnormal arch branching / vascular ring
- Conoventricular VSD (especially with other features)

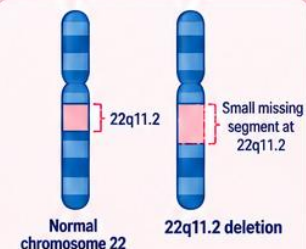
Also consider testing with any conotruncal/aortic arch abnormality or when cardiac disease is accompanied by extracardiac features suggestive of the syndrome.



Genetic Testing

- Chromosomal microarray (CMA) is usually the first-line genomic test.
- Targeted FISH, MLPA or qPCR can be used in selected situations.
- A normal routine karyotype does not reliably exclude the deletion.
- Recommend genetic counseling and parental testing once a deletion is identified.
- If a parent has the deletion, each pregnancy has a 50% chance of inheriting it.

Typical Chromosome Finding



Common Clinical Features (Variable — Not Everyone Has All Findings)



Cardiac

- TOF, truncus arteriosus
- Interrupted aortic arch
- Aortic arch anomalies
- Ventricular septal defects
- Vascular ring
- Other CHD



Immune System

- Thymic hypoplasia/aplasia (T-cell abnormalities vary)
- Most do not have severe immunodeficiency
- Immune evaluation important before live vaccines



Calcium / Parathyroid

- Hypoparathyroidism can cause hypocalcemia
- May present in the newborn or later in life (illness, surgery, puberty, pregnancy)
- Can cause seizures, tetany or QT prolongation



Palate / Feeding

- Cleft or submucous cleft palate
- Velopharyngeal insufficiency
- Hypernasal speech
- Feeding and swallowing difficulties



Development

- Speech and language delay
- Learning difficulties
- ADHD, anxiety
- Autism-spectrum features
- Increased risk of psychiatric disorders in adolescence and adulthood



Other Systems

- Renal anomalies
- Hearing loss / recurrent ear infections
- Thyroid disease
- Gastrointestinal issues
- Skeletal abnormalities
- Growth issues
- Ophthalmologic findings



Baseline Evaluation After Diagnosis

Multidisciplinary assessment helps identify and manage associated problems.

	Cardiac	Echocardiogram, ECG; define arch anatomy, branch PAs and associated lesions.
	Calcium / PTH	Ionized or total calcium, phosphorus, magnesium, PTH.
	Immune	CBC with differential, lymphocyte subsets; additional testing as guided by immunology.
	Thyroid	TSH + free T4.
	Renal	Renal ultrasound.
	Hearing	Audiologic evaluation.
	Palate / VPI	Palatal/velopharyngeal assessment.
	Feeding	Feeding/swallow evaluation when symptomatic.
	Development	Developmental, speech/language and educational assessment.
	Ophthalmology	Ophthalmologic evaluation.
	Genetics	Genetics consultation and parental testing.



Long-Term Follow-Up

Individualized care with a multidisciplinary team.

	Cardiology	Follow lesion-specific CHD surveillance (e.g., repaired TOF, truncus, interrupted arch) and monitor for residual lesions, arrhythmias and ventricular/aortic function.
	Immune / Vaccines	Ongoing immune evaluation. Live-vaccine eligibility depends on immune assessment, not the genetic diagnosis alone.
	Calcium / PTH	Monitor calcium during illness, surgery, puberty, pregnancy and when symptomatic.
	Development / Behavior	Long-term surveillance for learning, attention, behavior and mental health. Early-intervention services as needed.
	Hearing / Palate	Follow-up for hearing, speech and palatal/airway issues.
	Endocrine	Monitor thyroid function and growth.
	Renal / Other	Follow-up for renal, gastrointestinal, skeletal and ophthalmologic issues as indicated.
	Transition	Plan transition to adult care. Discuss reproductive counseling (50% transmission risk in each pregnancy).



Perioperative Considerations (Especially Cardiac Surgery)

- Check calcium before surgery and monitor calcium after surgery.
- Monitor magnesium and PTH when abnormalities occur.
- Be aware of risk for hypocalcemia, which can cause tetany, seizures or QT prolongation/arrhythmia.
- Communicate known or suspected immune abnormalities to the surgical and anesthesia teams.



Safety Pearls

- ✓ Do not assume a normal newborn calcium excludes later hypocalcemia.
- ✓ Do not assume all patients are severely immunocompromised.
- ✓ Do not make live-vaccine decisions from the genetic diagnosis alone.
- ✓ Do not stop surveillance after successful cardiac repair.
- ✓ Do not forget family testing — a mildly affected parent can be identified only after a child presents with major CHD.



Dr. Shabib Alhadheri, MD
Advanced Pediatric Cardiology



1478 W Elliot Rd, Suite 102, Gilbert, AZ 85233
480-855-1339