Tuberous sclerosis complex (TSC) is a genetic disorder characterized by the growth of benign tumors in multiple organs, including:

1. Numerous skin lesions
2. Lesions of the brain, kidneys, and lungs that significantly contribute to morbidity and mortality

Clinical manifestations of TSC can range from mild to severe and vary from patient to patient. Clinical manifestations of TSC can range from mild to severe and vary from patient to patient.

Organ Involvement in TSC

- **Ophthalmologic**: 30%–50%
- **Cardiac**: Up to 50% of newborns with TSC
- **Renal**: 80%
- **Brain**: 80%
- **Pulmonary**: Up to 80% of women with TSC
- **Dermatologic**: 90%

9 of 10 patients with TSC have skin manifestations.
Physical exam: Look for skin abnormalities

<table>
<thead>
<tr>
<th>IMAGE</th>
<th>SKIN LESION</th>
<th>AGE AT ONSET</th>
<th>CONSIDERATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image]</td>
<td>Hypomelanotic macules</td>
<td>At birth or infancy</td>
<td>• Observed in about 90% of individuals with TSC&lt;br&gt;• ≥3 lesions at least 5 mm in diameter must be present (1 or 2 lesions is relatively common in general population)</td>
</tr>
<tr>
<td>![Image]</td>
<td>Angiofibromas</td>
<td>Ages 2 to 5</td>
<td>• Occur in 75% of TSC patients&lt;br&gt;• ≥3 lesions must be present (1 or 2 isolated sporadic lesions often present in general population)</td>
</tr>
<tr>
<td>![Image]</td>
<td>Fibrous cephalic plaque</td>
<td>Ages 2 to 5</td>
<td>• Occurs in 25% of TSC patients&lt;br&gt;• Most specific skin finding for TSC&lt;br&gt;• Most common on forehead, but may occur on other parts of face or scalp</td>
</tr>
<tr>
<td>![Image]</td>
<td>Ungual fibromas</td>
<td>Second decade or later</td>
<td>• Occur in 20% of TSC patients overall, but in up to 80% of older adults&lt;br&gt;• ≥2 must be present</td>
</tr>
<tr>
<td>![Image]</td>
<td>Shagreen patch</td>
<td>First decade</td>
<td>• Occurs in 50% of TSC patients</td>
</tr>
</tbody>
</table>

Worth noting: Other more uncommon “confetti” skin lesions are seen throughout life and vary widely in frequency, from 3% in children to 58% overall. Minor dental features of TSC include multiple dental enamel pits (≥3) and multiple intraoral fibromas (≥2).
Understanding the genetic and clinical features of TSC

Genetic

Identification of a mutation in the TSC1 or TSC2 gene is sufficient to diagnose TSC. However, 10% to 25% of TSC patients show no mutations in these genes.

- If genetic test outcome is normal, or if testing is unavailable, the use of clinical diagnostic criteria is necessary for an accurate diagnosis.

Clinical

<table>
<thead>
<tr>
<th>DEFINITE DIAGNOSIS</th>
<th>POSSIBLE DIAGNOSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 major features or 1 major feature with ≥2 minor features</td>
<td>1 major feature or ≥2 minor features</td>
</tr>
</tbody>
</table>

**MAJOR FEATURES**

1. Hypomelanotic macules
   (≥3, at least 5 mm in diameter)
2. Angiofibromas (≥3) or fibrous cephalic plaque
3. Ungual fibromas (≥2)
4. Shagreen patch
5. Multiple retinal hamartomas
6. Cortical dysplasias (includes tubers and cerebral white matter radial migration lines)
7. Subependymal nodules
8. Subependymal giant cell astrocytoma (SEGA)
9. Cardiac rhabdomyoma
10. Lymphangioleiomyomatosis (LAM)*
11. Angiomyolipomas (≥2)*

*A combination of the 2 major features (LAM and angiomyolipomas) without other features does not meet criteria for a definite diagnosis.

**MINOR FEATURES**

1. “Confetti” skin lesions
2. Dental enamel pits (>3)
3. Intraoral fibromas (≥2)
4. Retinal achromic patch
5. Multiple renal cysts
6. Nonrenal hamartomas

THE CLINICAL FEATURES OF TSC VARY WIDELY FROM PATIENT TO PATIENT.
Serious complications of TSC

Renal angiomyolipomas are a major cause of morbidity and mortality in patients with TSC

• Approximately 80% of patients with TSC have renal angiomyolipomas

SEGAs can cause potentially life-threatening hydrocephalus

• These occur in up to 15% of patients with TSC

LAM is a lung disease that can present with progressive dyspnea on exertion and recurrent pneumothoraces

• It occurs in up to 80% of women with TSC, and in a smaller percentage of men

When your patients have skin features associated with TSC,
Consider referring them to a nephrologist, urologist, neurologist, or pulmonologist

For more disease information, visit www.tsalliance.org/TSC-clinics www.tuberous-sclerosis.com

References: