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The role of bubble contrast echocardiogram in the diagnosis of pulmonary arteriovenous malformations in children with *Dyskeratosis Congenita*.

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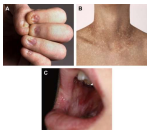
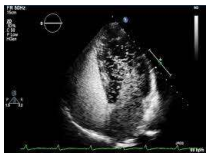
Dyskeratosis congenita (DC) is a rare inherited disorder caused by germline mutations in telomere genes.

The **classic diagnostic triad** of DC:
- reticular skin pigmentation
- dysplastic nails
- oral leukoplakia

Pulmonary manifestations include pulmonary fibrosis (PF) and **pulmonary arteriovenous malformations (PAVMs).**
The aim of this abstract is to present our case series and to discuss the role of transthoracic contrast echocardiography (TTCE) as diagnostic screening tool in DC patient affected by PAVMs.





OUR EXPERIENCE
Over the past 10 years, three patients have been diagnosed with DC at our Center.

	Patient 1	Patient 2	Patient 3
Age	12y	7y	3y
Desaturation	No	Mild	Mild
TTE	Bicuspid Ao	Patency of foramen ovale	Normal
TTCE	Positive for extracardiac shunt	Positive for extracardiac shunt	Positive for extracardiac shunt
Chest CT scan	No PAVMs detected	No PAVMs detected	PAVMs detected
Cardiac catheterism	Not performed	Multiple and diffused microPAVMs	Evidence of diffuse microfistulae and 2 PAVMs closed with vascular plug
HSCT	Yes	Yes	Yes
Follow up	Alive	Dead for MOF	Alive with a progressive respiratory failure and oxygen dependence

TABLE 1. Our experience at Ospedale Infantile Regina Margherita, Torino. Y: years; Ao: aortic; TTE: TransToracic Echocardiography; TTCE: TransToracic Contrast Echocardiography; PAVMs: pulmonary arteriovenous malformations; MOF: Multi-Organ Failure

DISCUSSION and REVISION OF LITERATURE
- PF is a well-known complication of DC that occurs in at least 20% of patients, while **PAVMs** have been described in a few case reports or small case series. Recent discussions with clinicians managing DC patients suggest that this latter type of complication may occur more frequently than has been previously appreciated.
- **Right-to-left extracardiac** shunt due to PAVMs causes deficit in arterial oxygenation and progressive respiratory insufficiency. If undetected and untreated PAVMs can cause serious life-threatening complications, including ischemic stroke, brain abscess and pulmonary hemorragy.
- **Transthoracic contrast echocardiography** (TTCE) with agitated saline solution may be an initial, simple and safe, screening test to identify an extracardiac shunt. In our center, over the last 10 years, we had 3 patients with DC and all of them performed a TTCE that resulted positive for extracardiac shunt. All of them underwenr a CT chest scan, but only in one of them PAVMs where detected. In two of them cardiac catheterism was performed and in both of them showed a PAVMs.
- The **clinical management** of DC requires a multidisciplinary approach and there is no specific treatment for DC other than allogenic bone marrow transplantation for bone marrow failure and supportive care with oxygen administration for those with severe pulmonary insufficiency. All our patients underwent HSCT and only one of them had negative outcome with death for MOF.

CONCLUSION
To the best of our knowledge, there are no consensus guidelines and recommendations for screening, management and follow-up of patients with DC and PAVMs, especially among children.
Over the past years has seen an increased interest in using TTCE as an initial screening procedure for PAVMs that is a simple, safe, widely available and easily performed technique to detect right-to-left shunting.
Herein we propose the TTCE both as an important initial screening test for the early diagnosis of PAVM in the pediatric population and as a useful routine examination to set up the follow up of these patients.

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