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On an equichordal property of a pair of convex bodies

Let $d \geq 2$ and let K and L be two convex bodies in $\mathbb{R}^d$ such that $L \subset \operatorname{int} K$ and the boundary of L does not contain a segment. If K and L satisfy the $(d+1)$-equichordal property, i.e., for any line l supporting the boundary of L and the points $\{\zeta_\pm\}$ of the intersection of the boundary of K with l,

$$\operatorname{dist}^{d+1}(L \cap l, \zeta_+) + \operatorname{dist}^{d+1}(L \cap l, \zeta_-) = 2\sigma^{d+1}$$

holds, where the constant σ is independent of l, does it follow that K and L are concentric Euclidean balls? We prove that if K and L have C^2-smooth boundaries and L is a body of revolution, then K and L are concentric Euclidean balls.