abstract

Keloid disorder (KD) is a fibroproliferative ailment of the cutaneous connective tissue secondary to dysregulation in various skin repair and healing processes. This disorder is characterized by excess collagen and/or glycoprotein depositions in the dermis. Age of onset of KD is not well documented. Based on clinical observations, various authors have reported the onset of KD to be between the ages of 10 and 30 years. We report on an African American female who developed bilateral auricular keloids at the age of 9 months. To our knowledge, this is the youngest age at which a patient has been documented to have developed KD. Pediatrics 2013;131:e313–e317
Keloids are benign skin tumors that form as a result of injury or inflammation of the dermis, typically in individuals who are genetically predisposed to this disorder. Rarely, keloids may develop de novo, without a previous noticeable irritation of the skin. Age of onset of keloid disorder (KD) is not well documented. Based on clinical observations, various authors have reported the onset of KD to be between the ages of 10 and 30 years. Mode of inheritance of KD is not known. Several theories have been proposed, including autosomal recessive, autosomal dominant with incomplete penetrance, and variable expression. Keloids are characterized by formation of excess scar tissue beyond the boundaries of the precipitating wound. Although benign, keloids can cause aesthetic or functional problems, all of which negatively affect the individual’s quality of life. Our patient developed bilateral auricular keloids when she was 9 months old, subsequent to earlobe piercing that had been performed at the age of 3 months. At 6.5 years of age, she is still challenged by this disorder.

**PATIENT PRESENTATION**

The female patient described here was born to African American parents on January 31, 2006. At 3 months of age, the pediatrician pierced her earlobes. No immediate complications or infections followed. When the child was 9 months old, her mother detected hard lumps in both earlobes. On October 18, 2006, the child’s pediatrician noticed and documented keloids in the posteriors of both earlobes. Over the next several months, the keloids grew gradually. At 3 years of age, the patient was referred for surgical removal of the keloids. Figure 1, the only extant preoperative photograph, depicts the appearance of the left earlobe keloid before surgery.

On June 19, 2009, at the age of 3.5 years, the patient underwent surgery under general anesthesia, and her keloids were excised from both earlobes. The tissue specimens were examined pathologically and confirmed to be KD (Figs 2 and 3). Postoperatively, bilateral pressure earrings were prescribed, but they were not well tolerated and not used. Within 2 months of surgery, both keloids relapsed, and despite several intralesional triamcinolone injections, they continued to grow, mostly anteriorly. On October 6, 2011, at the age of 5 years, the patient presented to the corresponding author. On examination, she was found to have gross bilateral anterior earlobe keloids (Figs 4 and 5), with minimal posterior earlobe keloids at the previous surgical sites.

The child had normal growth and development. She was breastfed until the age of 9 months. She had no other keloids. The only known family history of KD was found in the child’s mother. A single, dark spot on her left upper arm, on examination, had the appearance of a small, flat keloid.

With parental consent, the child underwent cryotherapy with monthly topical applications of liquid nitrogen to her keloids under local anesthesia. Within 5 months, and after receiving 2 treatments to the right anterior earlobe keloid and 3 treatments to the left anterior earlobe keloid, both keloids nearly flattened (Figs 6 and 7). Magnetic pressure disks were prescribed at this juncture; however, they were not well tolerated and were not used. By mid-June 2012, both keloids showed evidence of early relapse. Cryotherapy was resumed in late June 2012.

**DISCUSSION**

This case is a true representation of a disorder that is difficult to treat. Although keloids can occur at any age, they tend to develop more rapidly during and after puberty. In recent studies by Park et al that reported on a large cohort of keloid patients from Asia, the youngest subject described was a 10-year-old boy with auricular...
Keloids. The age distribution of patients with auricular keloids from their studies is described in Table 1.

Clark et al. studied 5 families with a total of 35 affected individuals with various keloid phenotypes and locations. The ages reported for first keloid development varied from 5 to 52 years. Sanders et al. presented data on 15 patients with keloids in the head and neck region. Among them, a 10-year-old boy with preauricular keloids was the youngest. Orimolade et al. described the case of a 6-year-old boy who had developed keloids in the pretibial area subsequent to chronic osteomyelitis with purulent discharge. Bermueller et al. reported treatment results for 33 patients with earlobe keloids; the youngest patient in their series was 10 years old. The aim of their study was to present long-term results in patients with auricular keloids after surgical excision and/or medical therapy by corticoid injection. A retrospective study at an academic tertiary referral center is presented.

A recent keloid survey (institutional review board approved) was launched in November 2011 by the corresponding author to capture detailed information directly from patients. Of the 339 patients with KD who had completed this survey as of July 11, 2012, only 1 reported development of first keloid at the age of 1 year; 2 patients reported developing their first keloids at the age of 2 years; and 1 patient reported keloid development at the age of 4 years.

Ear piercing is by far the leading cause of earlobe keloid formation in genetically predisposed individuals. Ear piercing is a widespread practice, commonly performed by nonmedical personnel in jewelry shops, stores, and malls. Parents often choose to have their daughters’ earlobes pierced at very early ages. The practice of ear piercing has never been the subject of scientific research. The results of a recent online consumer survey, however, revealed that 38% of participants claimed to have had their infant daughters’ ears pierced. The same survey indicated that 52% of parents had chosen to have the piercings performed at jewelry stores; 19% had chosen body-piercing parlors; and only 13% had elected to have the procedure performed at a physician’s office (Table 2).

Lane et al. reported that keloids are more likely to develop when ears are pierced after age 11 years than when they are pierced before that age, even in patients with a family history of KD. He recommended that patients with a family history of keloids should consider avoiding ear piercing altogether, and, if this is not an option, piercing should be considered during early, rather than late, childhood.

Although the conclusion of Lane et al. holds true in a great majority of patients, the case we have presented here defies this finding and testifies to the continuing gaps in our understanding of the pathogenesis and genetics of KD.

Some authors have suggested that the typical latency in earlobe keloid development...
development may be due to hormonal stimulation at puberty\textsuperscript{16} or during pregnancy.\textsuperscript{17} Clearly, neither of these conditions applied to this patient. One can only hypothesize that the breastfeeding and passage of mother’s hormones to her infant daughter may have played a role in the young child’s development of keloids.

KD’s true incidence and prevalence in the United States are unknown.\textsuperscript{9} To the best of our knowledge, no population study has ever been undertaken to assess this disorder’s epidemiology. Based on clinical observations, we do know that the disorder is most common among Africans and African Americans,\textsuperscript{16,18} Asians, and Indians from India. The pathogenesis of KD is for the most part unknown and poorly understood, and beyond the scope of this article. The acknowledged culprit in keloid formation, however, is the wounding of the skin and subsequent dysregulated wound healing, a complex, dynamic process that normally results in the restoration of the skin’s anatomic continuity and function.

The tendency of earlobe keloids to worsen after surgical excision (as exemplified in this case) is most probably secondary to the retriggering of the same dysregulated wound-healing mechanisms by the excision itself: a new dermal injury more extensive than the original wound from the piercing. Keloids may develop in an earlobe’s anterior, its posterior, or in both sides. They may appear as pedunculated, sessile monodellar, or sessile multinodular, or they can take a complex form. Keloid nodules may be superficial or have a root and be buried deep inside the earlobe tissue. Generally, it is agreed that with surgery alone, the recurrence of earlobe keloids is unacceptable high; therefore, multimodality treatment protocols have been proposed to reduce the recurrence rate.\textsuperscript{19–24}

Most therapeutic approaches to earlobe keloids incorporate surgical excision with immediate postoperative steroid injections, followed by some form of pressure device, such as a pressure earring or magnetic disk. Cryotherapy for earlobe keloids as monotherapy has also been reported as effective.\textsuperscript{25} On keloids’ recurrence after a multimodal approach, treatment becomes challenging. As shown in this case, cryotherapy can be used to debulk such recurrent keloids.

Although some practitioners use adjuvant radiation therapy to reduce keloids’ recurrence rate after surgery,\textsuperscript{16} this modality carries an unacceptable risk of inducing secondary neoplasms\textsuperscript{26} and should therefore be avoided in treating pediatric and young adult patients.

CONCLUSIONS

Thorough and scientific population and epidemiology studies of KD are needed. Scant data exist concerning KD’s incidence and prevalence in children aged <10 years. The case presented here is the youngest patient ever reported to have developed keloids.

Ear piercing is the leading cause of earlobe keloid formation in the young. Although most ear piercings take place outside of physicians’ offices, many pediatricians offer this service. Given the difficulty of treating keloids, pediatricians need to be aware of the risk of keloid formation and, at a minimum, should obtain a thorough family history of KD, especially from African American and Asian children, before performing ear-piercing procedures.

ACKNOWLEDGMENT

The corresponding author obtained parental consent for publication of this case report and the accompanying images.

REFERENCES


TABLE 2 Practice of Ear Piercing Among Young Females: Results of an Online Consumer Survey (Data as of July 11, 2012)

<table>
<thead>
<tr>
<th>Percentage of parents whose daughters do or do not have pierced ears (n = 9836)</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>Age at ear piercing (n = 4428)</td>
<td>&lt;2 y</td>
<td>2–3 y</td>
</tr>
<tr>
<td>48</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Location where the ear piercing was performed (n = 4296)</td>
<td>Jewelry store</td>
<td>Body-piercing parlor</td>
</tr>
<tr>
<td>52</td>
<td>19</td>
<td>13</td>
</tr>
</tbody>
</table>


14. BabyCenter. When are girls ready for pierced ears? Available at: www.babycenter.com/viewPollResults.htm?pollId=74866


