



Detection of Human Papillomavirus Type 39 in a Seborrhic Inclusion Cyst of the Buttock

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A seborrhic inclusion cyst (SIC) is a lesion, which has been described as a combination of seborrhic keratosis and an epidermoid cyst (EC). To the best of our knowledge, only eight cases of SIC have been reported thus far in the English literature.¹⁻³ Microscopically, SICs exhibit features that are suggestive of viral infection.⁴ Therefore, an association between SICs and human papillomavirus (HPV) has been suspected, but it has only been demonstrated in one previous report by Terada,¹ which identified an HPV-positive SIC through immunohistochemical staining for HPV antigens. However, no SIC study has ever used HPV genotyping. Herein, we report the first case of SIC associated with HPV type 39, which we identified using the HPV DNA chip.

CASE REPORT

A 21-year-old Korean man presenting with a subcutaneous mass in the left buttock was admitted to the Armed Forces Capital Hospital. An excisional biopsy of the lesion was performed, and gross examination of skin tissue revealed a 2 cm unilocular cyst that was filled with a soft, yellow substance. Microscopic examination of the lesion identified a cyst containing keratins (Fig. 1A). Approximately one half of the cyst exhibited features of a dermoid cyst with a mature squamous epithelium with granular layers and small clusters of sebaceous cells (Fig. 1D), while the other half demonstrated basaloid cell proliferation

and pseudohorn cysts (Fig. 1B). In addition, squamous eddies, vacuolated cells and parakeratosis were observed in the cyst wall (Fig. 1C). No significant area of inflammation as might be present in a foreign body reaction was observed in the adjacent soft tissue. There was also no evidence of viral infection, such as vacuolated cells or parakeratosis, at the skin surface.

HPV detection and genotyping were performed using the commercial HPV Genotyping Chip Kit provided by the Biomedlab Company (Seoul, Korea). DNA was isolated from the paraffin-embedded tissue using the DNA extraction kit that was supplied as a component of the HPV Genotyping Kit. Target HPV DNA and beta globin (as an internal control) were amplified by polymerase chain reaction (PCR) and labeled with cyanine 3 for signal detection. The amplified cyanine 3-labeled products were mixed with a hybridization buffer and applied to the DNA chip. Hybridization was performed at 60°C for 1 hour, and then the chip was washed for 2 minutes with distilled water and air-dried at room temperature. HPV DNA hybridization was detected using the DNA Chip Scanner (NimbleGen MS200, Roche, Basel, Switzerland). Of the 32 HPV genotypes tested, the HPV genotype 39 probe was hybridized with the DNA amplified from our specimen (Fig. 2).

DISCUSSION

SIC generally has been considered an EC variant due to the histological similarities. However, our case showed dermoid cyst-like features rather than EC, mostly because of the presence of sebaceous gland cells and the soft, yellowish content of the cyst. The content of ECs has a whitish toothpaste-like appearance rather than the yellowish atheroma-like feature of a dermoid cyst. Sebaceous cells of dermoid cysts product a lipid com-

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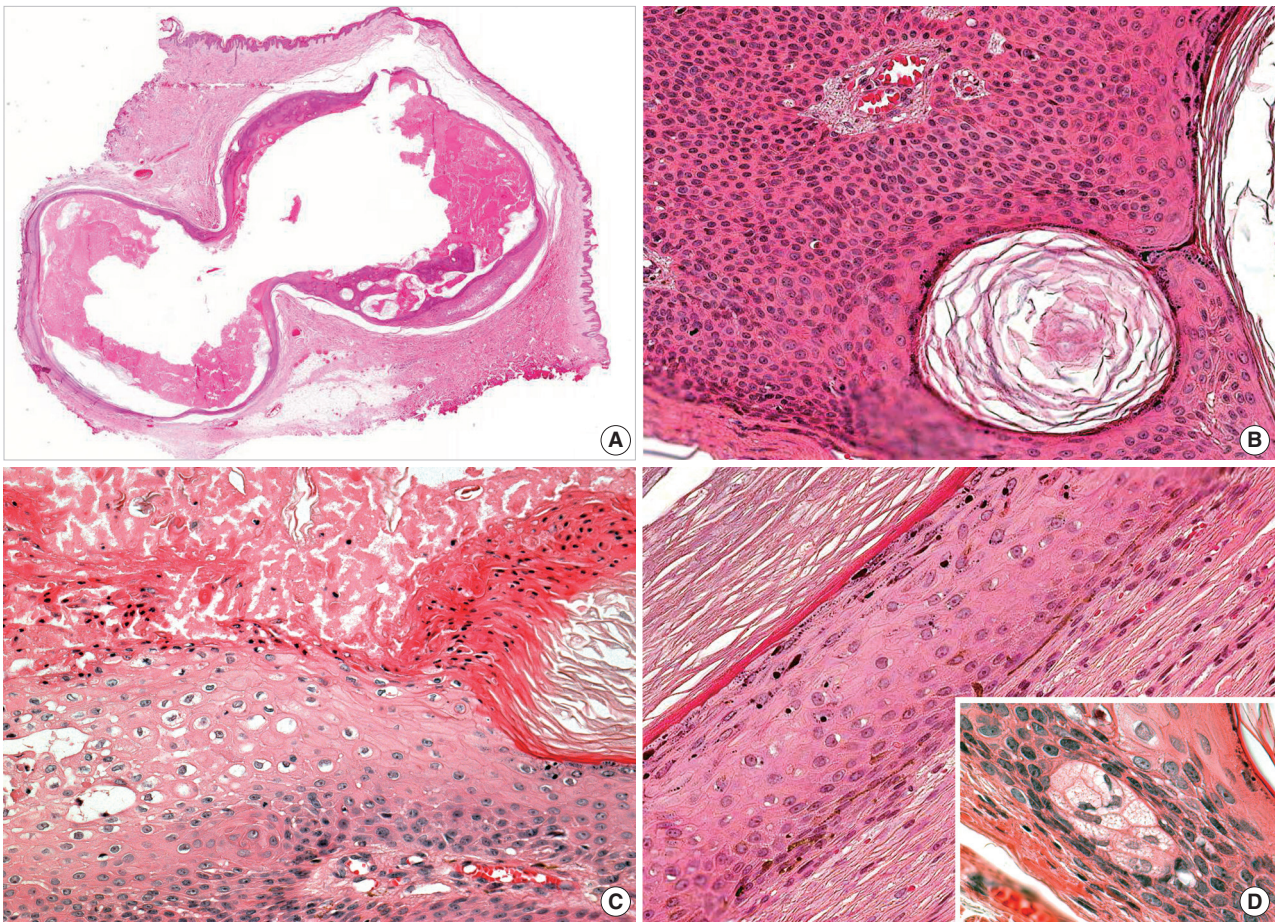


Fig. 1. Microscopic observation of a seborrheic inclusion cyst (SIC). (A) Low-power view of the SIC reveals an acanthotic cyst wall in the dermis. (B) Half of the cystic wall exhibits basaloid cell proliferation and pseudohorn cysts. (C) Parakeratosis and many vacuolated cells are visible in most areas of the cyst wall. (D) The other half of the cystic wall shows features of dermoid cysts and is lined by mature squamous cells with a granular layer; there are also several scattered foci of small clusters of sebaceous gland cells.

ponent, which gives their content a yellowish appearance. To our knowledge, the three previously reported SIC cases described the presence of soft, yellowish content,^{1,4,5} however, sebaceous cells in SIC have never been described. We suggest the possibility that undetected sebaceous cells were present in previously reported cases on the basis of their yellowish content,^{1,4,5} and SIC should be defined as a variant of cutaneous cysts rather than epidermal, epidermoid, or infundibular cysts.

Previous studies have questioned the association of SIC with viral infection since microscopic observations have revealed wart-like features, such as eosinophilic cytoplasmic inclusions, vertical tiers of parakeratotic cells, and vacuolated cells.⁴ In the present case of SIC, we also observed vacuolated cells and parakeratosis, which are features suggestive of viral infection, and we identified the HPV genotype 39 using DNA chip analysis. Two previous reports have examined the association between HPV

infection and SIC (Table 1). In a previous study, Terada¹ described microscopic observations indicating HPV infection and confirmed HPV infection by immunohistochemical staining. However, no such microscopic observations were mentioned in a case reported by Fernandez-Flores.⁴ Instead, Fernandez-Flores⁴ attempted HPV genotyping using PCR, but no HPV DNA was detected. Although few data have been published in regards to SIC with HPV, ECs of cutaneous cysts have been relatively well studied in regards to HPV infection. HPV types 57 and 60 were recently implicated in palmoplantar ECs.⁶ However, HPV type 39, which was detected in our case, has not been identified in EC. This high-risk HPV type was primarily cloned from Bowenoid papules of the penis, and it comprised 3.9% of the biopsy specimens collected from female patients infected with HPV.⁷ The clinical implications of high-risk HPV infection in non-genital areas have not been fully determined. Kim *et al.*⁸ identi-

Table 1. Summary of present and previous cases in which the association between human papillomavirus (HPV) infection and seborrheic inclusion cysts was examined

Case No.	Age (yr)	Sex	Country	Location	Microscopic indications of viral infection	Squamous eddies	Analysis tool	HPV detection	Reference
1	84	M	Spain	Left thigh	×	O	PCR	×	Fernandez-Flores ⁴
2	41	M	Japan	Neck	Eosinophilic cytoplasmic inclusion	×	IHS	O	Terada ¹
3	21	M	Korea	Left buttock	Vacuolated cell, parakeratosis	O	DNA chip	O	Present case

M, male; PCR, polymerase chain reaction; IHS, immunohistochemical stain.

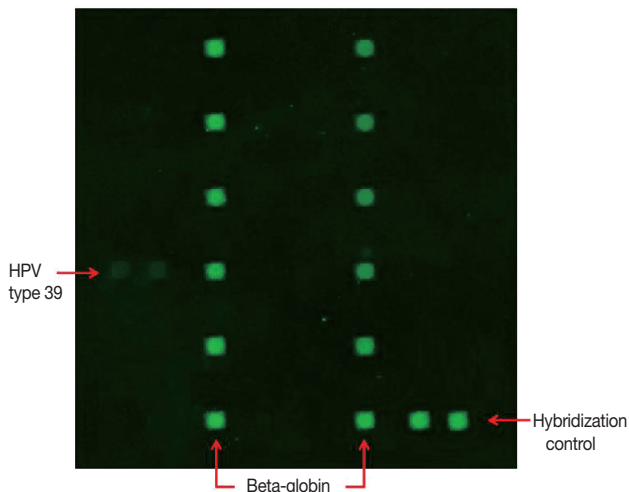


Fig. 2. Human papillomavirus (HPV) DNA chip analysis uses probes against 32 HPV genotypes. HPV genotype 39 is identified. Beta-globin is used as an internal control in two vertical rows with six spots each. Two spots of hybridization control and 12 spots of internal control worked well in our analysis.

identified the high-risk HPV type 59 in a verrucous cyst of the flank and suggested that closer attention will be needed to characterize the clinical behavior associated with that type of cyst. Therefore, further studies will be required in order to determine the clinical implications of skin lesions associated with high-risk HPV infection.

The pathogenesis of SIC with HPV infection is unclear. However, it has been mentioned that the development of EC along with HPV in areas lacking follicles, such as the palms and soles, could possibly be caused by the traumatic implantation of the epidermis. Park *et al.*⁶ described the development of EC in weight-bearing surfaces using three stages: first, a pre-existing wart is implanted into the dermis by weight; second, the implanted portion forms a cyst in the dermis. Finally, the pre-existing wart undergoes regression, leaving only the dermal cyst behind. Since the buttock, which was the location in our case, can also be considered a weight-bearing area, this theory could explain the pathogenesis of the cyst described in the present case. This theory was also supported by the association of nongenital seborrheic

keratosis with HPV infection, which was described by Tardío *et al.*⁹

In conclusion, we report a case of SIC associated with HPV type 39, which we identified using DNA chip analysis. This is the first report of successful HPV genotyping associated with SIC.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Terada T. Seborrheic inclusion cyst of the skin positive for cytoplasmic inclusion bodies and HPV antigen. *Int J Clin Exp Pathol* 2012; 5: 455-7.
2. Uchi H, Yasukawa F, Kiryu H, Hashimoto K, Furue M. Infundibular cyst with seborrheic verruca-like cyst walls in a patient with Yusho disease exposed to dioxins. *Eur J Dermatol* 2012; 22: 687-8.
3. Kwitken J. Seborrheic keratosis with epidermal cyst. *Mt Sinai J Med* 1980; 47: 258-60.
4. Fernandez-Flores A. Seborrheic inclusion cysts: a study of human papillomavirus infection by polymerase chain reaction. *Am J Dermatopathol* 2009; 31: 310-2.
5. Pusiol T, Zorzi MG, Morichetti D. Extracutaneous seborrheic inclusion cyst: an unusual presentation. *Pathologica* 2010; 102: 420-2.
6. Park HS, Kim WS, Lee JH, *et al.* Association of human papillomavirus infection with palmoplantar epidermal cysts in Korean patients. *Acta Derm Venereol* 2005; 85: 404-8.
7. Volpers C, Streeck RE. Genome organization and nucleotide sequence of human papillomavirus type 39. *Virology* 1991; 181: 419-23.
8. Kim H, Seok JY, Kim SH, *et al.* Human papillomavirus type 59 identified in a verrucous cyst of the flank. *Eur J Dermatol* 2006; 16: 254-7.
9. Tardío JC, Bancalari E, Moreno A, Martín-Fragueiro LM. Genital seborrheic keratoses are human papillomavirus-related lesions: a linear array genotyping test study. *APMIS* 2012; 120: 477-83.