Pityriasis rubra pilaris (PRP) is a papulosquamous disorder of unknown aetiology with distinctive but overlapping clinicopathological features with psoriasis. Recently CARD14 mutations have been found in some familial cases of both diseases (1, 2). CARD14 encodes a 1,004 amino acid protein, caspase recruitment domain-coding protein 14, which is an activator of NF-κB. Since most RPR patients are sporadic, it is worth screening for CARD14 in non-familial PRP. Here, we report a CARD14 gene analysis in 8 unrelated cases of typical sporadic PRP.

CASE REPORTS

Cases were collected from 8 consecutive Taiwanese patients with PRP currently seen in our clinic. All individuals were diagnosed with PRP by typical clinical features with histological confirmation from skin biopsies. Genomic DNA was extracted from blood using the Chemagic DNA Blood Kit. The CARD14 gene consists of 23 exons and spans 39,340 bp. PCR was used to amplify the coding exons and flanking introns of the CARD14 gene (RefSeq NM_024110.4). Standard DNA sequencing reactions were performed using fluorescence-labelled dideoxy chain terminations with the Big Dye Terminator ABI Prism Kit and the ABI PRISM 3130xl DNA Analyzer (Applied Biosystems, Foster City, California).

Our case series of PRP included 6 male and 2 female Taiwanese patients without a family history. Clinical characteristics and genetic polymorphisms of the patients are summarised in Table I. One male patient had type III classic juvenile PRP with a unique history of recurrence in adulthood. One male patient had type IV adult generalised PRP. One and c.2648G>A (p.Arg883His). All 8 patients had the missense variants c.1641G>C (p.Arg547Ser), c.2458C>T (p.Arg820Trp), and c.2648G>A (p.Arg883His). All 8 patients had the polymorphism c.2399-4A>G at the splice junction. One female with severe type I PRP only had this polymorphism of splice junction without other missense variants. Seven patients had the missense variant c.2458C>T (p.Arg820Trp) and 5 patients had the missense variant c.1641G>C (p.Arg547Ser). These SNPs are common in the Asian population according to phase I 1000 Genomes Project database, which included 97 Han Chinese (Table II). The polymorphism c.2399-4A>G at the splice junction is not known to cause mRNA splice variant. The amino acid changes of missense polymorphisms are mapped to the GUK domain or other regions of the CARD14 protein. To determine whether these non-synonymous SNPs affect the function of the CARD14 protein and contribute to disease, Polymorphism Phenotyping version 2 (PolyPhen-2) software was used to predict whether these SNPs would be harmful or not. Our results suggest that the SNPs are not likely truly damaging.
DISCUSSION

Most PRP cases are sporadic. However, familial forms with autosomal dominant or recessive inheritance have been reported. Acquired PRP usually develops in adulthood, whereas familial PRP usually presents during childhood (3–5). According to Griffiths’ classification, familial PRP frequently belongs to type V (atypical juvenile) (6–8). In 2012, heterozygous mutations in CARD14 (MIM 607211) (RefSeq NM_024110.4) were detected in PRP after analysing 4 unrelated families with autosomal dominant PRP (2). Amino acid mutations were c.467T>C (p.Leu156Pro) and c.412_414delGAG (p.Glu138del) which altered highly conserved amino acids. In one family, a mutation c.349+1G>A was found in the consensus donor splice site. This splice site mutation disrupted the CARD14 splicing and caused an in-frame insertion of 66bp originating from the intron, which led to 22 amino acids insertion during the translation. Interestingly, CARD14 mutations have also been detected in cases of familial psoriasis and correspond to PSORS2 (psoriasis susceptibility locus 2) [MIM602723] (1, 9). In the study of psoriasis, the mutations in CARD14 included missense mutations, c.349G>A (p.Gly117Ser), c.365A>G (p.Tyr122Cys) and c.413A>C (p.Glu138Ala). One splice donor sequence mutation c.349+5G>A has also been found in a Taiwanese family. Both c.349G>A and c.349+5G>A mutations caused the same aberrant splice mRNA variant containing an extra 66bp as found in the study of familial PRP (1, 2, 10).

In this report, no phenotype-genotype associations were revealed and none of the detected polymorphisms alone were pathogenic. A genetic dosage effect is also not seen. Other gene mutations and environmental factors may interact and result in the sporadic PRP phenotype. Furthermore, none of our cases belonged to type V, while a significant portion of familial PRP were reported as type V in the literature and CARD14 mutations were only reported in familial patients (2, 6–8). Therefore, it is possible that different mutations exist in different types of PRP.

In summary, we found no definite causative genetic mutation in CARD14 as identified in familial PRP after screening 8 non-familial patients of type I, type III and type IV PRP. The pathogenic mutation for non-familial non-type V PRP is still elusive.

The authors declare no conflict of interest.

REFERENCES

1. Jordan CT, Cao L, Roberson ED, Pierson KC, Yang CF, Joyce CE, et al. PSORS2 is due to mutations in CARD14. Am J Hum Genet 2012; 90: 784–795.
2. Fuchs-Telem D, Sarig O, van Steensel MA, Isakovic O, Isar-eli S, Nousbeck J, et al. Familial pityriasis rubra pilaris is caused by mutations in CARD14. Am J Hum Genet 2012; 91: 163–170.
3. Thomson MA, Moss C. Pityriasis rubra pilaris in a mother and two daughters. Br J Dermatol 2007; 157: 202–204.
4. Vanderhooft SL, Francis JS, Holbrook KA, Dale BA, Fleckman P. Familial pityriasis rubra pilaris. Arch Dermatol 1995; 131: 448–453.
5. Sehgal VN, Srivastava G, Dogra S. Adult onset pityriasis rubra pilaris. Indian J Dermatol Venereol Leprol 2008; 74: 311–321.
6. Albert MR, Mackool BT. Pityriasis rubra pilaris. Int J Dermatol 1999; 38: 1–11.
7. Vasher M, Smithberger E, Lien MH, Fenske NA. Familial pityriasis rubra pilaris: report of a family and therapeutic response to etanercept. J Drugs Dermatol 2010; 9: 844–850.
8. Griffiths WA. Pityriasis rubra pilaris. Clin Exp Dermatol 1980; 5: 105–112.
9. Tomforde J, Silverman A, Barnes R, Fernandez-Vina MA, Young M, Lory D, et al. Gene for familial psoriasis susceptibility mapped to the distal end of human chromosome 17q. Science 1994; 264: 1141–1145.
10. Jordan CT, Cao L, Roberson ED, Duan S, Helms CA, Nair RP, et al. Rare and common variants in CARD14, encoding an epidermal regulator of NF-kappaB, in psoriasis. Am J Hum Genet 2012; 90: 796–808.