Arch Gynecol Obstet (2015) 292:843–851
DOI 10.1007/s00404-015-3705-2

GENERAL GYNECOLOGY

Association of the intercellular adhesion molecule-1 (ICAM-1) gene polymorphisms with endometriosis: a systematic review and meta-analysis

Noel Pabalan[1,2] · Hamdi Jarjanazi[3] · Denise Maria Christofolini[4] · Caio Parente Barbosa[4] · Bianca Bianco[4]

Received: 6 October 2014 / Accepted: 26 March 2015 / Published online: 10 April 2015

Abstract
Background Reported associations of the *G241R* and *K469E* polymorphisms of the intercellular adhesion molecule-1 gene (ICAM-1) gene with endometriosis have differed in magnitude.
Materials and methods In a meta-analysis of six published case–control studies (from five articles), we estimated risk [odds ratio (OR) 95 % confidence intervals (CI)] of associations with these polymorphisms using the Review Manager 5.3 software.
Results Based on 1213 cases and 1103 controls, overall analysis showed significant increased risk in the homozygous (OR 2.83, 95 % CI 0.99–8.10, $p = 0.05$), dominant (OR 1.86, 95 % CI 1.00–3.46, $p = 0.05$) and codominant (OR 2.15, 95 % CI 1.06–4.35, $p = 0.03$) models. Confined to the studies in Hardy–Weinberg Equilibrium erased the significance (OR 1.59–2.59, 95 % CI 0.81–8.22, $p = 0.10$–0.15). Asian effects were variable (OR 0.93–1.09, $p = 0.50$–0.57), but Caucasian effects were not (OR 4.09–13.60, $p < 0.0001$). Independent data for the late stages of endometriosis suggest protection of the ICAM-1 *K469E* polymorphism among the Asians (OR 0.91–0.95, $p = 0.35$–0.71). These effects were weak but non-heterogeneous ($P_{\text{heterogeneity}} = 0.17$–$0.57$, $I^2 = 0$–40 %).
Conclusion In summary, strengths of the overall effects were consistency, significance and robustness but limited by their high heterogeneity. These strengths and limitations were also observed in the Caucasian subgroup which when tested for interaction against the contrasting Asian effects, highlighted Caucasian susceptibility ($p = 0.004$–0.01). The findings are an interplay of strengths and limitations, which warrant awareness of their interpretation as susceptibility markers for this disorder.

Keywords ICAM-1 · Polymorphisms · Endometriosis · Meta-analysis

✉ Bianca Bianco
bianca.bianco@hotmail.com

[1] Center for Research and Development, Angeles University Foundation, Angeles City 2009, Philippines

[2] Graduate School, Cebu Doctors' University, Mandaue City 6014, Philippines

[3] Environmental Monitoring and Reporting Branch, Ontario Ministry of the Environment, 125 Resources Road, Etobicoke, ON M9P 3V6, Canada

[4] Department of Gynecology and Obstetrics-Faculdade de Medicina do ABC, Human Reproduction and Genetics Center, Avenida Príncipe de Gales, 821, Santo André, SP Zip Code 09060-650, Brazil

Introduction

Endometriosis is a chronic and inflammatory condition in which tissue that is histologically similar to the endometrium with glands and/or stroma grows outside the uterine cavity [1]. Being multi-systemic, it can affect several organs, most common in the peritoneum and pelvis, especially the ovaries, and less in the recto-vaginal septum [2]. This results in pelvic pain, dysmenorrhea and infertility [3]. The pathogenesis of endometriosis is genetic [1, 4] and autoimmunity genes maybe involved [5]. A number of genetic studies have been found to be associated with endometriosis in selective populations [6–8]; however, the genes that play a role in endometriosis remain to be explored.

The intercellular cell adhesion molecule-1 (ICAM-1) is a member of the immunoglobulin (Ig) superfamily with a glycoprotein structure [9, 10]. ICAM-1 has been detected