Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Abstract

Background: A variable rate of false-positive results may be observed with commercial assays for the detection of rotavirus and adenovirus antigen in stool specimens, depending on the quality of the reagents and the presence of potentially interfering substances in stool samples.

Objective: The present report analyse the discrepant results that could be obtained by the commercially available diagnostic tests and that can mask the reliable viral diagnosis.

Study design: One fecal sample was collected from a hospitalized child aged 6 months with acute watery diarrhea and dehydration. The fecal specimen was processed the same day for the rotavirus and adenovirus antigen detection.

Results: The sample was positive for rotavirus antigen by one-step membrane test based on immunochromatographic assays (ICA) and enzyme immunoassays (EIA) monoclonal test but it was negative by an EIA polyclonal test, polyacrylamide gel electrophoresis (PAGE) and RT-PCR assays. In the other hand, the sample was positive for adenovirus antigen by ICA and EIA adenovirus type 40/41. Finally, the sample showed by PAGE an electrophoretic profile resembled that of reovirus.

Conclusion: The use of a wide repertory of diagnosis tests allowed to reach an unusual reovirus–adenovirus type 40/41 dual infection. This case also point out the potential participation of reovirus in the ethiology of the diarrhea illness.

© 2004 Elsevier B.V. All rights reserved.

Keywords: Unusual reo-adenovirus40/41 gastroenteritis; Diagnostic discrepancies

1. Introduction

Several different groups of viruses have been responsible for the high rate of acute viral diarrheal condition among children during their first few years of life. They are rotavirus, astrovirus, calicivirus including the Norwalk agent and enteric adenovirus type 40/41; today these viruses are called classic ethiologic agents of childhood diarrhea. On the other hand other viruses such as coronavirus, torovirus and reovirus are found only occasionally in fecal specimens and they are called unusual infectious agents.

Currently a variety of methods are commercially available for rapid laboratory diagnosis in stool samples for rotavirus, astrovirus and adenovirus gastroenteritis, i.e., enzyme immunoassays (EIAs), latex agglutination (LA) and immunochromatographic assay (ICA). They have become standard methods since they are easy to perform, require no special equipment and provide results in a short turnaround time. Although the performances of these assays have been improved, false positive results may be observed. On the other hand, electron microscopy (EM) and polyacrylamide gel electrophoresis (PAGE) are used as references methods for rotavirus detection because their high specificity; however, the equipment required is generally not found in diagnostic laboratories. More recently, probe assay and reverse transcriptase-polymerase chain reaction (RT-PCR) were reported as the most sensitive methods but they are not used widely as a diagnostic tool.

In contrast, there are no commercially available tests for the diagnostic of the unclassic agents. So, their role in the ethiology of the diarrhea disease might be underestimated.

We report here an unusual gastroenteritis diagnostic case in which the viral agents involved were difficult to establish. The aim of this study is to analyse the discrepant results that could be obtained by the commercially available diagnostic tests and that can mask the reliable viral diagnosis.

In April 2002, a child aged 6 months was assisted at the guard of a Public Childhood Hospital in Córdoba City, Argentina, with acute watery diarrhea and dehydration. The child was immediately hospitalized. One fecal specimen was collected at the hospital admission day and derived to the viral gastroenteritis unit, Instituto de Virología “Dr. J.M.
Correspondence / Journal of Clinical Virology 32 (2005) 71–72

Miguel O. Giordano, Laura C. Martínez, Leonardo J. Ferreyra, María B. Isa, Mirtha Paez Rarte, Jorge V. Pavan, Silvia V. Nates

References

Boom R, Sol CJ, Salimans MMM, Jansen CL, van Werdum PME, van der Noordaa J. Rapid simple methods for purification of nucleic acids. J Clin Microbiol 1990;28:495–500.

Denney PH, Gauntlett DR, Conte WE. Comparison of nine commercial immunochromatographic assays for the detection of rotavirus in fecal specimens. J Clin Microbiol 1988;26:1630–4.

Giordano M, Marínez L, Isa M, Ferreyra L, Cano F, Puran J, et al. Twenty year study of the occurrence of reovirus infection in hospitalized children with acute gastroenteritis in Argentina. Pediatr Infect Dis J 2002;21(9):880–2.

Gouvea V, Santos N, Carne Timenetsky M. VP4 Typing of Bovine and Porcine group A rotavirus by PCR. J Clin Microbiol 1994;32:1333–7.

Herring AJ, Inglis NF, Ojeh CK, Snodgrass DR, Menzies JD. Rapid diagnosis of rotavirus infection by direct detection of viral nucleic acid in silver-stained polyacrylamide gels. J Clin Microbiol 1982;16:473–7.

Laemmli UK. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. Nature 1970;227:680–5.

Rabenau H, Knoll B, Allwinn R, Doerr H, Weber B. Improvement of the specificity of enzyme immunoassays for the detection of rotavirus and adenovirus in fecal specimens. Intervirology 1998;41:55–62.

Miguel O. Giordano, Laura C. Martínez, Leonardo J. Ferreyra, María B. Isa, Mirtha Paez Rarte, Jorge V. Pavan, Silvia V. Nates.

Facultad de Ciencias Médicas
Instituto de Virología “Dr. J.M. Vanella”
Universidad Nacional de Córdoba
Córdoba, Argentina

Hospital Pediátrico del Niño Jesús
Ministerio de Salud Pública de la Provincia de Córdoba
Córdoba, Argentina

Corresponding author. Tel.: +54 351 4334022
fax: +54 351 4688272
E-mail address: snates@cmefcm.uncor.edu
(S.V. Nates)

25 June 2004

Vanella, Córdoba, for viral diagnosis, with a report that no white blood cells in the direct stool sample examination was observed. The fecal specimen was processed the same day, following the manufactured instructions, by a one-step membrane test based on immunochromatographic assays (ICA) (Diarlex MB, Orion Diagnostica, Espoo, Finland) for rotavirus and adenovirus antigen detection. The test resulted positive for both viruses therefore it was informed as a rotavirus–adenovirus dual infection. Although manufacturer’s instructions indicate that the relative intensities of the lines seen in the result window are irrelevant to the test result, we decided to re-test the stool sample because the rotavirus slightly weak line revealed. The specimen was assayed by two different EIAs (Rotazyme II, Abbott Laboratories, Diagnostics Division, Abbott Park, IL 60064 and Pathfinder™ Rotavirus, Sanofi Diagnostics Pasteur, France) rendering negative and low positive photometric results respectively. The discordant results compelled us to restate about the ethiology of the child infection. In order to achieve a more reliable diagnosis, the specimen was assayed by the rotavirus reference assay, that is PAGE, and revealed by silver stain (Herring et al., 1982; Laemmli, 1970). The electrophoretic pattern showed an RNA migration of 10 double stranded segments (three large, three medium and four small) which the characteristic genomic reovirus profile.

We hypothesize that the rotavirus positive results obtained by ICA and monoclonal EIA could be referred to a cross-reactivity with reovirus and/or with other components of the stool (Denney et al., 1988; Rabenau et al., 1998). Nevertheless, it could not be presumed that rotavirus was present in the stool sample at a very low concentration because the two techniques that rendered negative results (Rotazyme II and PAGE) are less sensitive than the monoclonal EIA. Thereby, the sample was assayed by reverse transcriptase-polymerase chain reaction (RT-PCR) to amplified directly from stool specimen the rotavirus gene segment coding for the major outer capsid glycoprotein VP 7. Rotavirus double-stranded RNA was extracted from the stool according to Boom’s method (Boom et al., 1990) and used as the template for reverse transcription, which was then amplified using the Taq polymerase, according to Gouvea method (Gouvea et al., 1994). The result revealed that no rotavirus was found in the stool specimen.

Finally the sample was also analysed by Adenoclon type 40/41 enzyme-immunoassay (Adenoclon type 40/41, Cambridge Biotech Cooperation, Worcester, Mass), rendering positive result. Therefore the viral ethiology of the child infection was now assigned to a dual infection by reovirus and adenovirus type 40/41.

This unusual diagnostic situation illustrate that the use of different currently viral laboratory test kits could render not only discrepant results but also they could mask the accurate ethiology of viral gastroenteritis. Moreover, it must be taken account the potential participation of reovirus in the ethiology and severity of the diarrhea illness. A few isolated reports associating reovirus with human diarrhea have been presented (Giordano et al., 2002). Therefore, the present report adds evidence that reovirus can be found in fecal specimens from hospitalized patients with diarrhea.

References

Boom R, Sol CJ, Salimans MMM, Jansen CL, van Werdum PME, van der Noordaa J. Rapid a simple methods for purification of nucleic acids. J Clin Microbiol 1990;28:495–500.

Denney PH, Gauntlett DR, Conte WE. Comparison of nine commercial immunochromatographic assays for the detection of rotavirus in fecal specimens. J Clin Microbiol 1988;26:1630–4.

Giordano M, Marínez L, Isa M, Ferreyra L, Cano F, Puran J, et al. Twenty year study of the occurrence of reovirus infection in hospitalized children with acute gastroenteritis in Argentina. Pediatr Infect Dis J 2002;21(9):880-2.

Gouvea V, Santos N, Carne Timenetsky M. VP4 Typing of Bovine and Porcine group A rotaviruses by PCR. J Clin Microbiol 1994;32:1333-7.

Herring AJ, Inglis NF, Ojeh CK, Snodgrass DR, Menzies JD. Rapid diagnosis of rotavirus infection by direct detection of viral nucleic acid in silver-stained polyacrylamide gels. J Clin Microbiol 1982;16:473-7.

Laemmli UK. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. Nature 1970;227:680-5.

Rabenau H, Knoll B, Allwinn R, Doerr H, Weber B. Improvement of the specificity of enzyme immunoassays for the detection of rotavirus and adenovirus in fecal specimens. Intervirology 1998;41:55-62.

Miguel O. Giordano, Laura C. Martínez, Leonardo J. Ferreyra, María B. Isa, Mirtha Paez Rarte, Jorge V. Pavan, Silvia V. Nates.

Facultad de Ciencias Médicas
Instituto de Virología “Dr. J.M. Vanella”
Universidad Nacional de Córdoba
Córdoba, Argentina

Hospital Pediátrico del Niño Jesús
Ministerio de Salud Pública de la Provincia de Córdoba
Córdoba, Argentina

Corresponding author. Tel.: +54 351 4334022
fax: +54 351 4688272
E-mail address: snates@cmefcm.uncor.edu
(S.V. Nates)

25 June 2004