Cost analysis in patients with suspected chronic infection at musculoskeletal implants: PCR Unyvero™ i60-ITI versus traditional technique

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Introduction

Polymerase chain reaction (PCR) techniques could improve the sensitivity of traditional techniques for the diagnosis of prosthetic-joint infection (PJI)[1].

A new specifically designed molecular biology test (Unyvero™ i60-ITI) has shown its usefulness in several reports, with a high specificity and positive predictive value[2].

Microbiological diagnosis of implant-related infection is essential for the selection of the ideal antibiotic therapy based on the individual susceptibility of any isolated micro-organisms[3,4].

Objective

To assess the costs of patient management based on diagnosis by adding a PCR technique (Unyvero™ i60-ITI) to traditional techniques involving conventional culture (TT) versus using TT only.

Methods

The assessed samples corresponded to prosthesis from patients admitted at Fundación Jiménez Díaz Hospital (Madrid, Spain), who underwent implant removal due to chronic infection suspicion from May-2014 to Jun-2016.

The study was authorized by the Research Ethics Committee of the Hospital.

Removed implants were processed by sonication techniques (low-intensity ultrasound for the disintegration of biofilm before culture) and sonicated samples were processed for microbiological diagnosis either using only TT, or using Unyvero™ i60-ITI added to TT.

Intravenous vancomycin and ceftazidime were selected as the initial empiric treatment. Replacement to a specific antibiotic was performed, if required, after microbiological final diagnosis.

A database was designed for data collection (including medical hospital records for sociodemographic data, antibiotic treatment and hospital length of stay [LOS]) and a cost analysis model was developed in Microsoft Excel® for the estimation of total costs (€, 2016) at hospital level :

- Antibiotic treatment, empiric and specific, (calculated based on ex-factory prices[5] with mandatory deduction[6])
- Hospital stay (€978.28 per day of admission[7]).
- Unyvero™ i60-ITI kits cost (€350 per kit).

Results

The analysis included a total of 24 patients (mean age= 74.6±8.75 years; 71% women): 10 samples were tested with TT and 14 with Unyvero™ i60-ITI added to TT.

Hip (46%) and knee (42%) were the most frequent implant sites (Table 1) and microbiological infection was confirmed in 67% of total cases.

Average period from implant removal to etiological final diagnosis lasted 4.60 days with TT. The use of Unyvero™ i60-ITI reduced this time in 2.31 days.

Average LOS was also reduced by 2.26 days using Unyvero™ i60-ITI added to TT compared to TT only.

Average antibiotic treatment cost per patient was €735.31±927.95 for TT and €527.92 ±757.93 for Unyvero™ i60-ITI added to TT (Figure 1).

References:

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	TT	TT + Unyvero™ i60-ITI
Population, N(%)	10 (42%)	14 (58%)
Age (years)	77,03±6,31	72,71±10,24
Gender, Hombres (%)	20%	36%
Comorbidities, (%)		
Hypertension	70%	43%
Diabetes	30%	14%
Obesity	10%	29%
Autoimmune diseases	20%	0%
Immunodeficiency	30%	0%
Others*	90%	36%
Prosthesis location, (%)		
Hip	40%	50%
Knee	40%	43%
Shoulder	20%	7%
Type of prosthetic infection, (%)		
Acute	50%	43%
Hematogenous	50%	36%
Chronic	0%	7%
Not defined	0%	14%

Table 1. Patient characteristics

Average hospital stay cost per patient was €23,870.03 ±19,082.45 and €21,661,91 ±21,197,69 for TT and Unyvero™ i60-ITI added to TT, respectively (Figure 2).

The cost of Unyvero™ i60-ITI kits per patient was €375.00 ±93.54 (average use = 1.04 kits per patient).

- **The use of Unyvero™ i60-ITI reduced average total costs in €2,040.50/patient.**

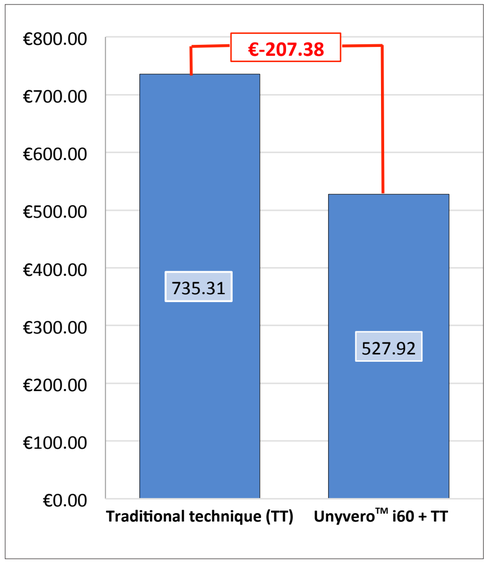

Figure 1. Antibiotic treatment cost

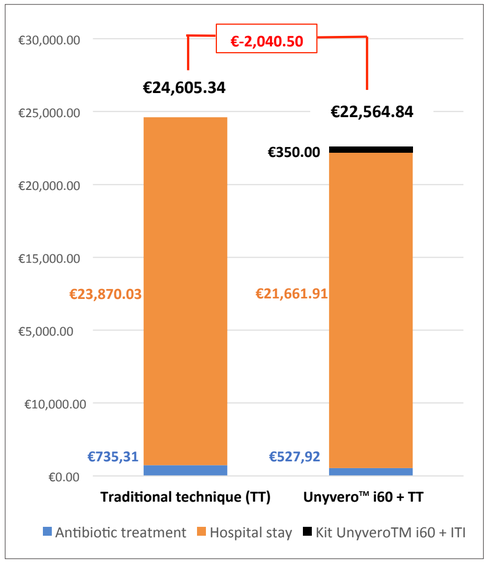

Figure 2. Average cost per patient.

Conclusions:

› Unyvero™ i60-ITI PCR may play a key role for microbiological identification in musculoskeletal implants sonicated, in rapid diagnosis of PJI when a high suspicion of infection is considered.

› The use of Unyvero™ i60-ITI PCR is associated to shorter LOS than diagnosis based on TT only, allowing cost savings at hospital level.

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