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ORIGINAL SCIENTIFIC PAPER

Impact of the Iranian Registry of Infective Endocarditis (IRIE) and multidisciplinary team approach on patient management

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ABSTRACT

Backgrounds: The last 30 years have witnessed major improvements in understanding of all aspects of infective endocarditis (IE). The Iranian Registry of Infective Endocarditis (IRIE) was formed to address epidemiological aspects of IE vis-à-vis its main pathogens and underlying heart diseases over a 12-year period. Indeed, a multidisciplinary team (MDT) for IE was developed alongside.

Methods: In a longitudinal observational study, data of adult patients with definite or possible IE based on modified Duke criteria were collected from 2007 to 2016 in our tertiary centre, Iran. From 2016 until 2019, we run a prospective observational study using formation of an IE MDT to provide better patient management and compared data before and after this.

Results: Totally, 645 patients with mean age of 48 ± 17 years were enrolled. Data of 445 and 200 patients were compared before and after IRIE and MDT formation, respectively. We found significantly reduced type and number of applied antibiotics ($p = 0.04$) and higher rate of positive blood culture ($p = 0.001$). Hospital length of stay increased significantly after formation of the IRIE and IE MDT ($p = 0.02$). The rate of heart failure, new abscess formation and cerebral emboli were significantly decreased after IRIE and IE MDT ($p < 0.001$) and consequently in-hospital mortality reduced significantly ($p = 0.05$).

Conclusion: Developing national registries and MDTs has potential to enhance patient management and reduce IE burden. Our results demonstrated that establishment of the Iranian IRIE and IE MDT conferred better diagnoses, standardised treatments and significantly reduced cardiac and extra cardiac morbidity.

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Endocarditis; registries; patient management; multidisciplinary team; Outcomes

Introduction

Infective endocarditis (IE) is an important clinical entity due to its high morbidity and mortality rate, healthcare expenditure and difficult diagnostic and therapeutic issues [1]. The incidence and severity of this lethal disease is still unchanged despite the rapid pace of diagnostic and therapeutic options [2]. This could be partly explained by the impact of epidemiological patient profile and growing number of patients living with cardiac devices or prosthetic valves also. Noticeably, we encountered an altered profile of IE, worldwide, with a decreased rate of rheumatic heart disease in developed nations by a parallel increase in degenerative heart diseases and with a subsequent increased rate of old age, comorbidities, intra cardiac devices and healthcare acquired IEs [3–5]. In younger patient population, IE is often seen in intravenous drug users and cases affected with adult congenital heart disease. Indeed, the rate of identification of causative agent is higher in developed nations while this rate is lower among developing nations [3, 6]. Thus, local data regarding IE causative microorganism, patient risk factors, complications, drug resistance and hospitalisation should be provided for optimal patient care. This ideal dataset would de gathered after accomplishment of local registries.

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Despite of these temporal changes in IE profile, significant progress has been made regarding health service factors such as new diagnostic and therapeutic implements and updated clinical practice guidelines with outstanding impact on IE care. However, correct and on-time diagnosis of IE, identification of the type, dose or duration of antibiotic therapy and following medical versus surgical approach is not a simple task and needs a multidisciplinary team approach (MDT), as noted in ESC guideline 2015 [7]. Still, many follow up studies have been done to evaluate the outcomes and care of these patients [4]. This best practice is highly demanded for complex cases that would be benefitted from compliance with guideline. Establishment of such expert teams and working registries would provide further knowledge for specific subgroups to improve both treatment and prognosis. Nevertheless, randomised trials are still lacking to guide the management of the disease, and the role and indications of antibiotic prophylaxis are still the subject of debate [8]. International multicenter studies are providing new important findings based on the experience of tertiary centres; these results may reflect referral biases. Thus, the aim of Iranian Registry of IE (IRIE) was to improve the management of IE through a better understanding of the demographic, clinical, therapeutic and prognostic features of the disease among Iranian population [9]. In this study we evaluate how IE registry affects our patient care during diagnosis and management. Indeed, the role of MDT approach in better patient care will be implemented in this survey.

Methods and material

Primarily we evaluated the data of definite and possible IE patients based on the modified Duke criteria who admitted between January 2007 and January 2016 in this retrospective study. The exclusion criteria were subsequent ruling-out of the IE diagnosis, age younger than 18 years, incomplete treatment and outpatient status. This study was approved by Research Committee of Rajaie cardiovascular medical and research centre, is a tertiary centre with a median 100–120 infective endocarditis patient admission per year, Tehran, Iran. The enrolled cases were enrolled after getting signed informed consent. From 2016 till 2019, IRIE prospectively included definite and possible IE patients to address the epidemiological aspects of IE including the clinical characteristics, aetiology, underlying heart diseases and prognosis. Alongside with beginning of our registry in 2016, we formed the IE MDT including physicians with various specialties such as two specialists in infectious diseases, an echocardiologist with extensive experience in the interpretation of valvular diseases, a cardiovascular surgeon, a general cardiologist and an epidemiologist. Each patient was evaluated in organised weekly or biweekly seasons on how to continue the treatment or the need for surgery. Finally, we compared the different aspects of the IE patient management before and after developing IRIE and MDT of IE.

Statistics

The statistical analyses were performed with the SPSS software, version 15, for Windows (SPSS Inc, Chicago, IL). The results are presented as the mean ± the standard deviation (SD) for the quantitative variables and summarised by absolute frequencies and percentages for the categorical variables.

Results

In this study, 645 patients with definite or possible IE and mean age of 48 ± 17 years were enrolled. Data of 445 patients before IRIE and MDT formation were compared with 200 patients after IRIE and MDT formation. There was significantly reduced types and number of used antibiotics before versus after developing IRIE and MDT (38 types before vs. 25 types after registry, $p = 0.04$). We observed a significantly increased rate of positive blood culture after versus before developing IRIE and MDT (43% before vs. 76% after registry, $p = 0.001$). The rate of surgical intervention was 257(57.9%) before IRIE and MDT and 110 (55%) after IRIE and MDT with no significant different before versus after registry ($p = 0.7$).

There was also a significant improvement in the rate of cardiac and extra cardiac complications before and after the formation of the IRIE and IE MDT. The rate of heart failure 52.8% in retrospective versus 35.5% in prospective registry ($p < 0.001$). The rate of new abscess formation was 17.4versus 6.5% in prospective registry ($p < 0.001$). The rate of cerebral emboli was 38.8% in retrospective versus 17.5% in prospective registry ($p < 0.001$). There was a significant reduction in the rate of vascular mycotic aneurysm before (2%) versus after registry (1%; $p = 0.01$). Indeed, there was a significant increase regarding to the length of hospital stay before and after the formation of the IRIE and IE MDT (before: 32.85 ± 19.06 d vs. after: 42.07 ± 17.92 d, $p = 0.02$). In-hospital mortality decreased significantly after 26 (0.13%) versus before 82 (0.18%) registry ($p = 0.05$). In Table 1, data regarding comparison between the clinical, bacteriological

Table 1. Summarised comparison between the clinical, bacteriological and prognostic features of the two groups and also degree of significance of their observed differences.

	Before IRIE and MDT	After IRIE and MDT	*p* Value
Number of antibiotics	38	25	0.04
Positive blood culture	191 (43%)	152 (76%)	0.001
Cardiac and extra cardiac complications			
Cerebral emboli	173 (38.8%)	35 (17.5%)	<0.001
Heart failure	235 (52.8%)	71 (35.5%)	<0.001
New abscess formation	77 (17.4%)	13 (6.5%)	<0.001
Vascular mycotic aneurysm	9 (2%)	2 (1%)	0.01
Surgical intervention	257 (57.9%)	110 (55%)	0.7
Length of hospital stay	32.85 ± 19.06	42.07 ± 17.92	0.02
In hospital mortality	82 (0.18%)	26 (0.13%)	0.05

and prognostic features of the two groups and also degree of significance of their observed differences are included in summary.

Discussion

The main findings derived from this large before-and-after study is summarised as: higher rate of positive blood culture, decreased type and number of used antibiotics, lower rate of cardiac and extra-cardiac IE complications such as new heart failure, abscess formation, cerebral embolism and mycotic aneurysms. Alongside with the continuous alteration in epidemiological patterns of IE, the rapid progress made in its guideline directed management strategies. One of the most important points of updated guidelines are their emphasises on regional differences and providing the Endocarditis team [7,9–12]. Thus, local registries and MDT approach can provide local information and strategies for better management of the IE, which is a high morbidity and mortality disease. To the best of our knowledge, IRIE along with MDT that consists both retrospective and prospective parts, are the largest registry with MDT in the Middle East.

By development of formalised MDT in our tertiary hospital and providing regular meetings and annual scientific sessions, we observed a better physicians and personnel communication and more scientific and guideline- based approach to the IE patients. Consequently, we observed higher percentage of IE cases with positive blood culture which leads to more accurate diagnosis and management of IE cases. Indeed, physicians involved in the MDT had regular meetings to discuss about the patients and hospital challenges and finding a solution for them. This is the same with Chirillo et al.'s findings who depicted fewer culture negative native valve IE cases. The proper identification of IE cases based on positive blood culture means consequently lower rate of inappropriate antibiotic therapy. Thus, the fewer type and number of prescribed antibiotics following IRIE plus MDT is reasonable. In our study, the rate of cerebral embolic events reduced significantly after IRIE plus MDT. This is compatible with Kaura et al.'s [13] findings who observed half of embolic events prior to IE team working. We also found significant decrease in the rate of heart failure as a complication of IE, this is in contrast to Kaura et al.'s [13] findings who found no significant pre and post IE team management regarding development of heart failure. But as generally accepted, complications of IE would be decreased after IE team management, due to the effort of all team members. Early detection of disease and management prior to development of complications has significant importance in this regard [14]. In this study, the mean duration of hospital length of stay increased after IRIE plus MDT despite of the reduction in total IE complication and better antibiotic therapy. This finding is in contrast with Chambers et al.'s [15] findings who demonstrated reduction in hospitalisation from 30 to 24 days [15]. Our speculation is that prolonged hospital length of stay in our study is due to appropriate length of hospitalisation of IE cases compared with previously applied course of hospitalisation. We believe that some of the previous IE cases did not receive appropriate hospitalisation course and application of MDT with completing antibiotic therapy resulted in prolongation of hospitalisation. Earlier and better management of high-risk cases is also an additive speculation. The decreased rate of in-hospital mortality after development of MDT approach and IE strategy seems to be due the decreased rate of IE complications and better guideline based medical approach in these patients also. Our finding is consistent with findings of Chirillo et al. [16].

The benefits of MDT approach in decision-making, management and treatment of IE cases are well documented. Reports of the results of this pre and post MDT IE management, represents another proof for the efficacy of such an approach in the treatment of IE cases. This is in alongside with recent guidelines advocating formation of MDT- based treatment of IE in major centres [15].

Conclusion

Developing national registries and MDTs has the potential to significantly enhance patient management and reduce the burden of IE in terms of its morbidity and extra costs. Our results demonstrated that the establishment of the Iranian IRIE and IE MDT conferred better diagnoses (significantly higher rates of positive blood cultures), standardised treatments (guideline-based antibiotic therapies) and significantly reduced cardiac and extra cardiac morbidity. Conclusively, treatment of IE would be improved after establishment of regional MDT which is in the path of adherence with European and American guidelines as part of preventive and therapeutic policies in each country.

Limitations

The limitation of this study includes its inherent bias risk given the type of the study as being a single-centre observational study. Indeed, we did not apply other cardiac imaging methods including F-Fluorodeoxyglucose positron emission tomography (F-FDG PET)/computed tomography (CT), radiolabeled leucocyte Single-photon-emission computed tomography (SPECT) /CT and cardiac CT for evaluation of the patients with IE. Participants in group 2 patients of our study were cases with possible or definite IE based on the Duke criteria. Unfortunately, F-FDG PET/CT and radiolabeled leucocyte SPECT/CT are not available in our centre yet and in our retrospective questionnaire also, Cardiac CT was not included, too. Further studies using these imaging tools are highly recommended in future investigations.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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