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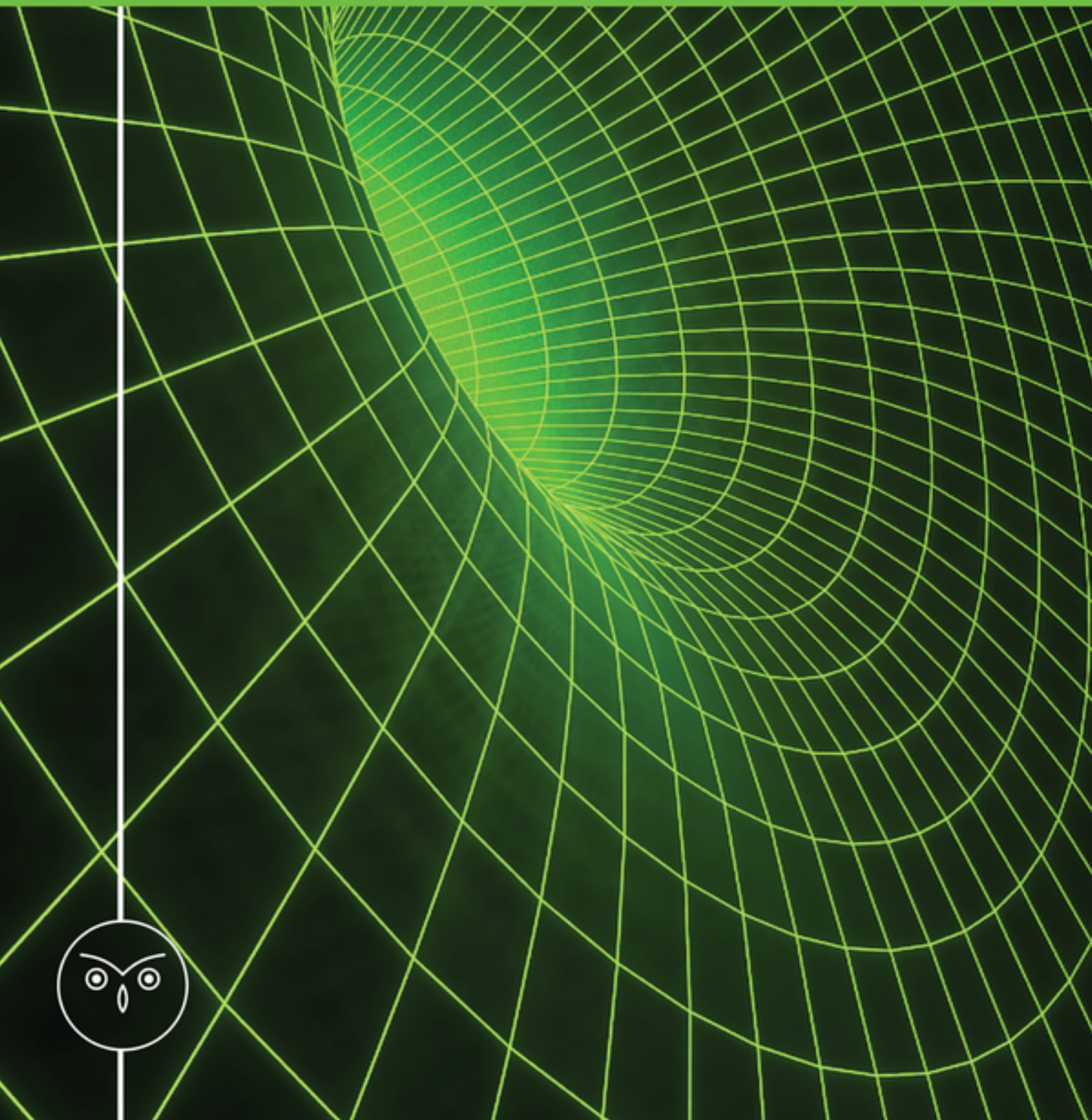

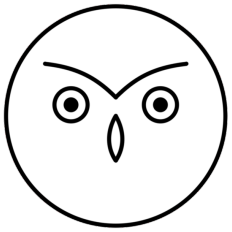

The Cuban Scientist

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Dear reader,

We are delighted to close a new issue of The Cuban Scientist, featuring articles on topics as varied as children's health and alternative fuels.

Once again, we have received the contributions of a broad community that strengthens and promotes the objectives of TCS towards a greater interaction of the Cuban and international scientific community.

We want to thank all of you for being a part of the TCS journal, and especially for this issue.

In this issue:

Automotive waste energy recovery with thermoelectric generators

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Thermoelectric generators arise as an option to recover part of the great amount of energy wasted as heat in the exhaust systems of internal combustion engines. Results of fuel savings with diesel and gasoline engines are provided.[b]

In internal combustion engines, about a third of the fuel energy intake is wasted through the exhaust system. Recovering part of this energy could save fuel and reduce emissions in passenger and commercial vehicles. Among the most well-known technologies to turn waste thermal energy into electrical energy, the most well-known are: Organic Rankine Cycles (ORC), electric turbo-generators (eTG) and thermoelectric generators (TEG). For light-duty vehicles, ORC has the drawbacks of high weight and high space necessity, leaving eTGs and TEGs as the most viable options. TEGs (see Fig. 1) convert thermal energy into electrical energy using the Seebeck effect.

Figure 1: Experimental setup with TEG circled in white [1].

A TEG was designed using CFD numerical simulations with the target of maximizing the electrical output while minimizing the extra pumping work caused [2]. The prototype was coupled to the exhaust system of a light-duty diesel engine.

Nine stationary points (A to I, see Fig. 2) representative of the real driving area of the engine map were selected for experimental tests. Results show that up to 0.56% of energy savings could be obtained [3].

In addition, a comparison between TEGs and eTGs in a light-duty gasoline engine was made. The main disadvantage of eTGs was identified: during common driving conditions, they produce a very high pressure drop that overcomes the electrical production, leading

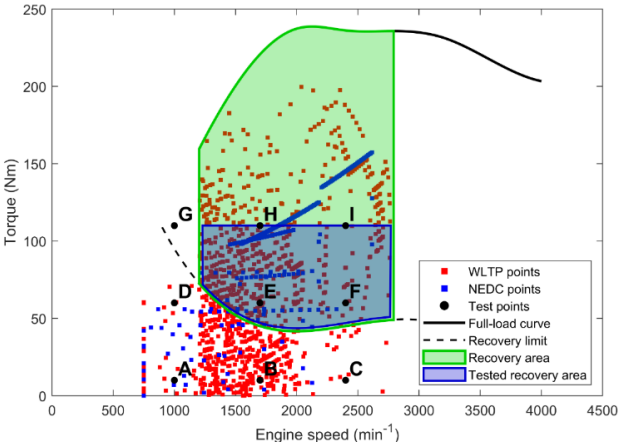

Figure 2: Steady test points selected based on New European Driving Cycle (NEDC) and World Harmonized Light-duty Vehicle Test Procedure (WLTP) driving tests.

even to negative net power production [3]. In addition, eTGs need more underhood space.

Findings indicated that up to a 1.1% of fuel savings can be obtained from a TEG in real driving conditions for a light-duty gasoline engine [3].

These results pointed TEGs as the path to follow to recover energy in light-duty engines. In addition, from the assembly point of view, the TEGs can be integrated nearer the end of the exhaust system, having more potential to be implemented in the underbody of cars.

In another work [4], it was determined the potential for energy recovery from exhaust gases with thermoelectric generators in a passenger car using three fuels (diesel, gas-to-liquid, and biodiesel) at different altitudes (20, 625 and 2300 masl). The potential for energy recovery was found always higher under extra-urban driving conditions at all altitudes tested due to the higher engine load and, consequently, higher temperatures and gas mass-flow rates reached. This result was particularly noticeable at high altitudes, where the EGR valve is usually closed.

The influence of the TEG on the energy fluxes in a diesel engine was also analized. The addition of a TEG causes modifications in the distribution of the energy fluxes in an engine, altering the global energy balance

and its efficiency (see Fig. 3). Regarding its integration in vehicles, a TEG could be active during all driving conditions. The TEG causes a mild improvement on the efficiency of the engine due the low efficiency of current thermoelectric materials. At middle engine loads, the exhaust energy is enough to produce enough energy to overcome the increase in pumping work, which translates into an increase in the efficiency of the engine. At low loads, the electrical production is almost null, but in exchange the pressure losses are the same, not causing penalties in the global efficiency when the device is not active. It was found that, within the limits of common engine conditions, the engine torque has more influence than the engine speed.

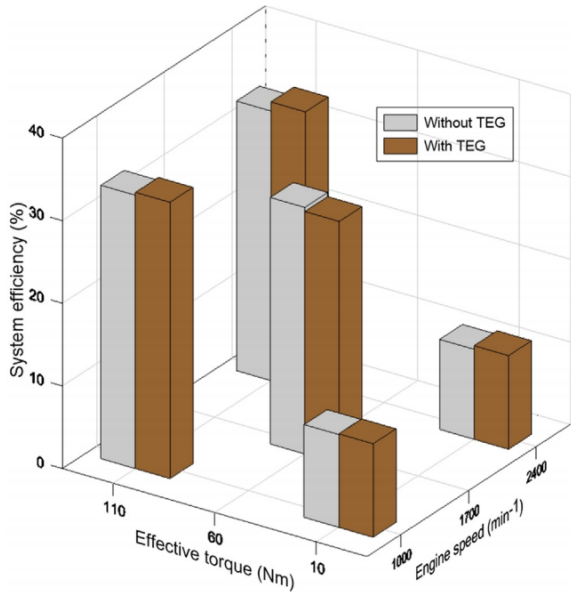

Figure 3: Change in global efficiency of a 2L diesel engine with and without a TEG [5].

Conclusions

Estimations of the production of current commercial thermoelectric modules lead to electrical gross power values of 480 W at full load conditions with a TEG composed of 80 thermoelectric modules (see Fig. 4). For essential electric consumers of a vehicle, an average of 300 W is needed (around 1 kW if we include other long-term electric consumers). With further development, a TEG could be a substitute of the inefficient engine-alternator system.

Concerning waste energy recovery with TEGs, three main areas of research have been identified: improving the properties of thermoelectric materials, reducing the exhaust gas convection thermal resistance and adapting the commercial thermoelectric modules to the exhaust temperature range in internal combustion engines of road vehicles [6]. Our current work focuses on the latter two, combining experimental tests with numerical simulations.

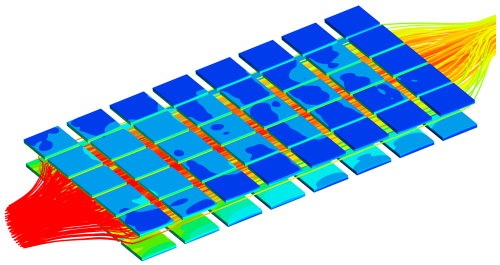

Figure 4: CFD numerical simulation of a TEG. The inside hot exhaust gas and the thermoelectric modules are shown.

Acknowledgements

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Notes

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b. The following researchers also participate in this work: Dr. José A. Soriano, Dr. Arantzazu Gómez and Dr. Luis Sánchez-Rodríguez from UCLM and researchers from University of Jaén.

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Didactic experiences aimed at strengthening of Organic Chemistry in the training of radiochemists

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Concise review on some educational experiences in a process of strengthening the teaching of Organic Chemistry in the training of the radiochemists at InSTEC [b]

The Radiochemistry specialty at the Higher Institute of Applied Technologies and Sciences (InSTEC) is structured in 63 subjects organized in 14 disciplines. One of them, the Organic Chemistry discipline, has two subjects: Organic Chemistry I and II. The analytical programs of both are extensive and include countless families of compounds, types of reactions, and mechanisms by which they occur. For this reason, these subjects are considered one of the most complex in the Radiochemistry career curriculum and therefore requiring a comprehensive interdisciplinary educational approach. No previous interdisciplinary experiences were applied at InSTEC, including other similar specialities. Here we cover some educational experiences carried out in order to strengthen the teaching and learning of the Organic Chemistry in the training of radiochemists. The educational experiences were developed for students of the 3rd year of the Radiochemistry Specialty in the InSTEC during five consecutive courses between 2010 and 2014.

Linking Organic Chemistry and Defense

The need for linking the content of the discipline Organic Chemistry with the Preparation for the Defense, came from the general Radiochemistry syllabus that includes a brief characterization of the specialty and contains, among others, the curriculum, the general objectives and the value system, to be developed in order to ensure the Radiochemist Professional Identity [1]. In this one, the objectives for the third year declare that the design of experiments has to take into account, among other factors, the defense of the country. Two seminars were proposed in which students could identify, relate, describe, characterise, argue, and explain the organic substances of interest to the Defense. The seminars were developed with the InSTEC Department of Defense and the Executive Authority National Center for the Non-Proliferation of Chemical Weapons [2]. Students reviewed the books individually and selected the substances without the participation of the professors. A high level of independence was observed in all students regarding the organisation of visits, search and review of information, and the results achieved in the class presentation. This experience also led to the strengthening of ties between teachers and specialists of the parts involved.

Introducing Concept Maps

The lack of a global vision is often the main problem in undergraduate students and therefore it is difficult for them to integrate multiple and diverse relationships between carbon compounds. On the other hand, concept maps providing a visual method to help students organize their thoughts, are also useful tools in science, and help making connections between subjects. They are also tools by which various concepts and their relationships can be easily represented. As a teaching strategy to improve the understanding of concepts in Organic Chemistry contents (I and II) by the students, seminar were proposed. Throughout the seminars, students could identify and relate organic compounds, types of reactions, and mechanisms using concept maps. Moreover, the students could identify the concepts and categories establishing the relationships between Organic Chemistry I and II [3]. Some learning difficulties were observed while the students were working with the concept maps, such as the confusion among members of different chemical families, the wrong choice of different reaction mechanisms, and improper hierarchy. Overall, the seminars were successful. Despite the mistakes, the students could establish relations of the two subjects globally and included all the compound families in the maps.

Linking Organic Chemistry and History

Radiochemist Professional Identity recommends actions to promote student participation in history forums [1], including curricular strategies. It was proposed to hold a seminar where the students had to present an individual work, with a free topic. Students could choose either subjects related to historic events in Organic Chemistry or biographies of researchers related to the relevant knowledge studied [4]. Consequently, students presented the chosen topics each

year. A high level of student independence was observed in the search and review of information, as well as a satisfactory presentation of their works. Most of the students chose biographical themes, and all consulted only digital encyclopedias on the internet. As a result, all of the works presented had a positivist and internal character.

Computer skills in organic chemistry

The need to link the content of the Organic Chemistry discipline with those of Informatics and Computing, in the Radiochemistry specialty, arises from the Professional Identity [1]. Therefore, computer science became an inherent part of professional training. Extra class exercises were arranged. A list with the name of organic compounds was given to the students. Each student had to choose only one compound from the list. The content of the report was made with the following issues: the image with the structure of the compound using the CHEMWINDOW software, a second image with the optimized construction including the compound's properties obtained using the HYPERCHEM program; and the image of the 3D structure and the table with the partial charges calculated using SPARTAN program [5]. As a result, the students presented the reports accurately and clearly, having understood the different types of structures and how to use softwares and programs.

Teaching strategy in pedagogical training students

The pedagogical training students (PTE) are those with high teaching achievement who are distinguished by showing faster assimilation of knowledge and good aptitudes for learning. They are undergraduate students who excel in the domain of specific academic disciplines and participate in the development of teaching activities in the lower years of the specialty, under a tutor's guidance. This PTE carries out complementary tasks to their study plan to receive additional training, such as preparing laboratory practice jobs, giving solution of exercises previous to the practical classes, and the compilation of information for a seminar, among others. In that sense, at InSTEC there is a strong experience with pedagogical training students. To contribute to it, an educational strategy was applied in order to raise the educational preparation necessary in the PTE for teaching through lectures. It was proposed conferences prepared and given by the PTE while taking the course. To develop the activity, some topics were distributed to those who prepared the conference independently, including presenting their work in class for evaluation [6]. The presentations were straightforward; explanations showed some logical reasoning, and PTE employed illustrative conversation and showed experiments in the classroom. In all cases, the PTE achieved the highest rating in the lectures.

Conclusions

Satisfactory results were achieved during the five years experiences aiming at strengthening the teaching of Organic Chemistry for radiochemists. The students chose the appropriate substances for their presentations and demonstrated an understanding of the difference between a chemical weapon and its precursors. It was possible to motivate the students to give importance to the Defense Preparation discipline subjects, showing them the link it has with the subjects of the curriculum of the specialty. In the second activity, despite the mistakes, the students could establish relations of the subjects globally and included in the concept maps all the interrelated compounds' families. So, global vision was improved. In the next one, it was possible to link the teaching of the Organic Chemistry discipline with history. In all cases, the students were right to locate their event in the historical periods of chemistry development. The students presented the requested structures and properties accurately in the report and clearly showed that they had understood the different types of structures and softwares in the activity related to Informatics and Computing. Finally, PTE students taught their classes satisfactorily, and the knowledge imparted was appropriately assimilated as a contribution to their educational preparation. Overall the interdisciplinary links were achieved between Organic Chemistry and other disciplines of Radiochemistry specialty.

Notes

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b. Original version of this article is Ref. [6]

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Theoretical and experimental study of aviation fuel sprays in an optical reciprocating engine, under Unmanned Aerial Vehicle like conditions and controlled atmospheres

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This work is focused on improving the knowledge of physical and morphological characteristics of aviation fuel injection sprays with application in unmanned aerial vehicles (UAV). This work is carried out by means of the combination of complex and singular experimental techniques such as an optical engine and Schlieren technique with modelling tools [1][b].

The work done is divided into two parts: 1) Experimental and modelling of fuel rates of injection with different jet fuels, fossil and renewable hydrogenated and 2) Experimental study of fuel sprays visualization with an optical reciprocating reproducing unmanned aerial vehicle like conditions, under both inert and reactive atmospheres at different simulated altitudes (between 0 and 3000 m above the sea mean level). The research group have a non-negligible background about the characterization of injection process with different alternative fuels (biodiesel, paraffinic hydrocarbons, alcohols, etc.) [2, 3]

The work is carried out by means of the jet fuel sprays experimental characterization and its modelling, using different techniques, among others, an optical reciprocating internal combustion engine. Related to characterization of fuel injection system, first results show the effect of different fuels on the rate of injection and the spray momentum flux.

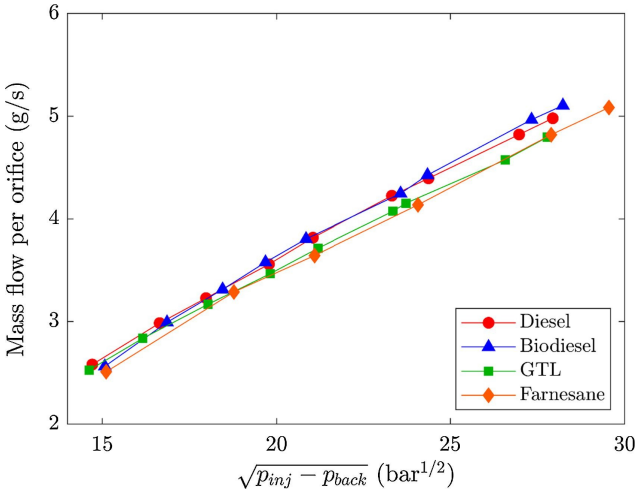

Figure 1: Mass flow rate per orifice under stabilized conditions, for all the fuels, obtained from momentum flux test rig.

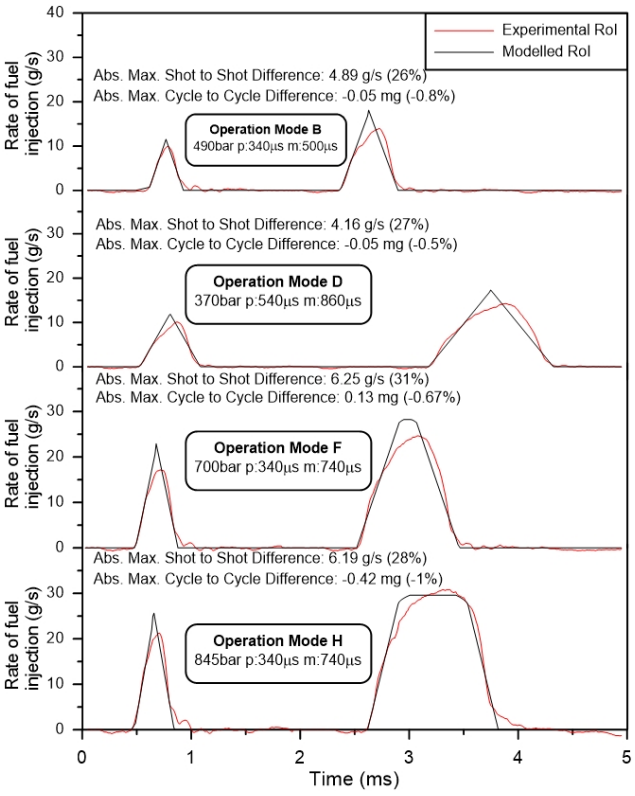

Figure 2: Fuel rates of injection experimental and modelled under different operating engines modes.

Results

As Figure 1 shows [4], evaluated methods (experimental and calculation) provide a valid rate of injection despite being a theoretical approach and relying only on momentum flux experiments and the total injected mass.

Regarding modelling the rate of injection with zero dimensional models, Figure 2 shows results obtained by means of the fuel injection rate indicator and zero-dimensional modelling [5] under different engine operating conditions.

Zero-dimensional model proposed in this part of the

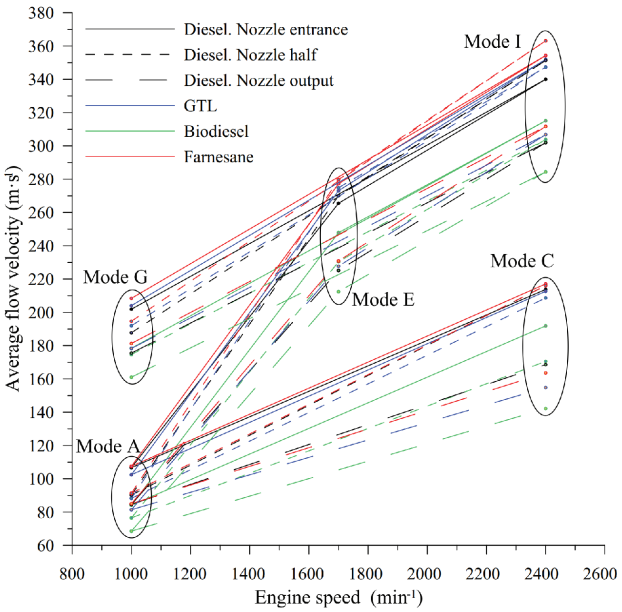

Figure 3: Fuel flow mean velocity from the five tested operating modes at the inlet, middle and outlet sections of the nozzle orifice with four fuels tested vs. engine speed.

study has demonstrated to be very useful for predictive and experimental thermodynamic models for calculation of the heat release along the combustion process within the engine cylinder.

Results of computational fluid dynamic modeling (Figure 3) show the effect of fuel origin on the internal flow along the nozzle orifice of the injector [6].

At medium engine load the effect of the needle lift on the cavitation generation is more significant than the fluid circulation velocity and fuel origin impacts as follows: Biodiesel > GTL > Farnesane > Diesel; while, at medium or high engine speed, an increase of engine load causes a decrease of cavitation generation and fuel origin impacts as follows: Diesel > Farnesane > GTL > Biodiesel.

Currently the work is going on with the experiments in the optical engine.

Conclusions

Main conclusions of this part of the work are the following: The tests of fuel rate of injection allow a good estimation of the spray momentum flux. The proposed zero-dimensional model for calculating the rate of fuel injection is simple but at the same time has precision enough to be used during thermodynamic diagnosis. Fuel origin has a non-negligible effect on the internal flow fluid-dynamic within the injector nozzle.

Notes

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Characterization of *Helicobacter pylori* infection in children and adolescents in an ambulatory service

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Helicobacter pylori infection is widespread, particularly in developing countries, and plays a vital role in acid peptic disease.[b]

Helicobacter pylori, under certain clinical situations, presents a very varied evolution, which includes a broad spectrum, from chronic superficial gastritis to gastric cancer, and includes chronic atrophic gastritis, gastric ulcer, duodenal ulcer, and gastric lymphoma of B cells of the mucosa-associated lymphoid tissue (MALT lymphoma) in the infected patient. [1, 2, 3] This strong association of *Helicobacter pylori* with gastric cancer has allowed it to be declared by the WHO as a class I carcinogen. [3] Most of the population world is infected with *Helicobacter pylori*. People generally acquire the infection in childhood, which usually persists throughout life. In children, the prevalence of *Helicobacter pylori* infection varies between 10-80% in different populations worldwide. By ten years of age, more than 50% of the world's children are infected. Therefore, identifying the transmission mechanisms in this age group is of fundamental importance. [4, 5]

Objectives

(1) To know the prevalence and some clinical, epidemiological data for describing the endoscopic findings (erythematous gastritis, nodular and duodenal ulcer) and relate them with the histological findings.

(2) To describe the association among the histological degrees of chronic gastritis and the positivity of the rapid urease test, and the presence of *Helicobacter pylori* according to histology and identifying by *Helicobacter pylori* with age the number of patients with chronic antral gastritis and duodenal ulcer.

Methods

A prospective, descriptive study was carried out during three years. A survey of symptoms and a physical examination was made to the patients and/or parents. Panendoscopy was performed with prior informed consent, two antral mucosa biopsies for rapid urease test, and a histopathological study (hematoxylin-eosin and Giemsa) to determine the degree of gastritis and the presence of *Helicobacter pylori* according to the Sydney system. Infection was demonstrated by one of the methods.

Results

196 patients among 7-18 years (mean 14.6) were selected of 471 (41.6%). 53% were female, and 59.7% were between 10 and 14 years old. By endoscopy, 49.5% had antral erythematous gastritis, 36.8% antral nodular gastritis, and 13.7% duodenal ulcer with associated gastritis. 29.6% had a family history of peptic ulcer, 85.2% of epigastralgia, 46.4% with acidity, 21% with vomiting, and 16.3% with nausea. Concerning the time of evolution to the diagnosis, the group of more than one year prevailed (24.5%), followed by one of 4-6 months (22.4%). All presented chronic gastritis of different degrees: light (34.7%), moderate (37.2%), and severe (28.1%), with *Helicobacter pylori*by rapid urease 83.2%, and 93.4% by histology with a coincidence of both methods in 150 (76.5%). The presence of lymphoid nodules was observed in 41.8% atrophies of different degrees (3.06%) and one patient with intestinal metaplasia (0.5%). The presence of chronic gastritis (59.7%) and duodenal ulcer (55.6%) due to *Helicobacter pylori* predominated in the 10 to 14 years old group. Our results coincide with expectations since it is a population with peptic acid disease.

Discussion

The prevalence of infection rises with increasing age. There are no sex differences in the rate of infection. The prevalence is higher in groups with lower socioeconomic status. The highest frequency was found in the 10 to 14 years old group in our series, which is consistent with the different authors. [4, 5, 6] These data indicate, without a doubt, that infection by this bacterium occupies one of the first places, due to its frequency, among all bacterial infections that affect humankind. [1, 2, 3, 4, 5] *Helicobacter pylori* were more frequently found by histology compared to the rapid urease test. There was a good relationship between the endoscopic findings and the histological findings found. The most significant association found of the rapid urease test's positivity and the histology with the endoscopic diagnosis was in patients with duodenal ulcer, followed by antral nodular gastritis, which coincides with most of the authors. [4, 5, 7] *Helicobacter*

pylori infections are common and cause gastroduodenal inflammatory lesions in children and adolescents, particularly antral nodular gastritis. The highest association found of the rapid urease test's positivity was in patients with chronic gastritis degree III, and the highest association found in the histology was in chronic gastritis degree II. There was a significant association of *Helicobacter pylori* by both methods. It is suggested that *Helicobacter pylori* infection is a potent aggressor of the stomach mucosa, and in a study of infected asymptomatic children evaluated two years after diagnosis without having received treatment, progressive mucosal damage was observed, despite the absence of symptoms. It has been reported that the inflammatory infiltrates of polymorphonuclear leukocytes in the gastric mucosa persisted up to two months after the eradication of the bacillus; normal mucosa was observed in most of the patients in the fourth year of follow-up, and lymphoid aggregates were maintained, despite observing normal mucosa for a period of 3 or 4 years. *Helicobacter pylori* infection is frequent in children and adolescents, causing gastroduodenal inflammatory lesions, particularly antral nodular gastritis, an endoscopic indicator of a high degree of bacterial colonization and severe gastritis.

Conclusions

Helicobacter pylori infection is frequent in children and adolescents, causing gastroduodenal inflammatory lesions, particularly antral nodular gastritis. Both diagnostic methods find an essential association of *Helicobacter pylori*. Follow-up by biopsy is recommended, especially for those who continue with chronic infection and have lymphoid nodules due to the risk of presenting B-cell gastric lymphoma of the lymphoid tissue associated with the mucosa (MALT lymphoma) if *Helicobacter pylori* eradication is not achieved. It is recommended to use Giemsa stain, in addition to hematoxylin-eosin, due to its ease of performance and to increase the identification of *Helicobacter pylori*. In developing countries, *Helicobacter pylori* infection is a health problem. The high prevalence of infection makes it necessary to develop public health interventions.

Notes

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Study of the performance and pollutant emissions of a new paraffinic fuel –Farnesane– compared to other alternatives in a Diesel engine

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This work focuses on the effect of alternative fuels (biodiesel and paraffinic) on the injection and combustion processes, on the regulated pollutant emissions (NOx, THC, PM) and the characterization of the particulate material generated from a physic-chemical point of view (morphology, oxidation, chemical reactivity) and biological (genotoxicity and mutagenicity).[b]

Biodiesel and Gas to Liquid (GTL) are the fuels most used as alternative to diesel fuel. Reductions in terms of carbon monoxide (CO), hydrocarbons (THC) and particle matter (PM) are obtained with these fuels while nitrogen oxides (NOx) emissions used to (in some engine load modes) be higher compared to reference fuel. However, while the study of the effect of these alternative fuels on the injection and combustion processes must be enlarged, the information about the morphology and reactivity of PM and its biological impact (genotoxicity and mutagenicity) is scarce.

In the different studies carried out in this research line, four fuels were selected: i) a diesel fuel considered as reference, without biodiesel, ii) a biodiesel and iii) a GTL fuel and iv) Farnesane, other paraffinic fuel obtained from the fermentation of sugary biomass by means of genetically modified microorganisms. This is a fuel traditionally used in jet engines.

Results

From the engine tests carried out at different engine load, it was obtained: i) information about how the fuel delivery occurs inside the cylinder from the injection rate and momentum flux, from the properties of the fuels and the geometric characterization of the injector, ii) values of regulated gaseous pollutant emissions as well as the amount of particulate matter (PM) (distribution and mass). The PM collected was analyzed from 3 points of view: morphology, chemical reactivity and biological analysis in terms of mutagenicity and genotoxicity.

The results obtained related to the experimental injection rates and the determination of the momentum flux (CDM) allow developing a simple 0D rate model. This tool is useful for those researchers who do not have the facilities to evaluate these parameters [1]. Also allowed develop alternative techniques for determination injection rate if only the equipment to determine momentum flux is available [2].

The thermodynamic diagnosis indicated that the start of combustion occurred before with paraffinic fuels but their combustion, duration was longer compared to diesel and Biodiesel fuels [3]. Despite these results, NOx emissions with Farnesane and GTL were similar to those observed with diesel, being results from Biodiesel the highest as is shown in Figure 1. Notable reductions in CO, THC and PM emissions were obtained with alternative fuels, being the highest benefits associate to Biodiesel. while results obtained with Farnesane were slightly lower than GTL (also paraffinic hydrocarbon) [4].

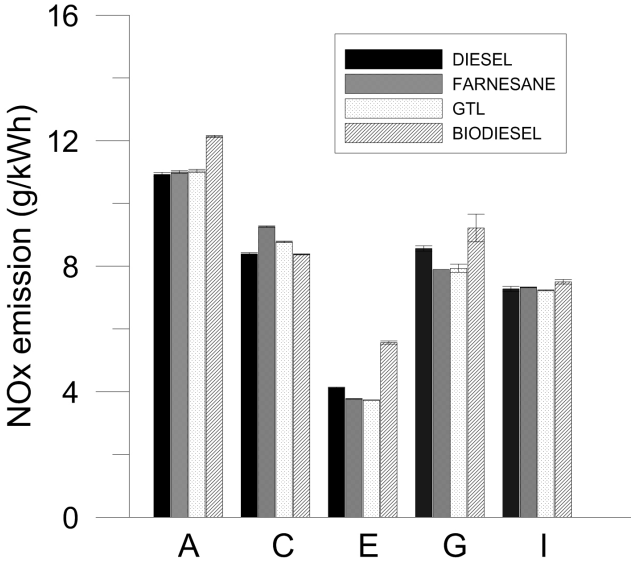

Figure 1: NOx emissions of alternative fuels tested compared with diesel.

In some engine load conditions, the PM is high enough that allowed to collect some samples to analyze its structure and reactivity in more depth. The chemical reactivity with the Biodiesel PM was the highest followed by GTL and Farnesane [5]. This trend is obtained by means of parameters such as Active Surface Area or Volatile Organic Fraction (VOF) and ashes content, results derived from TGA analysis of particulate matter (see Figure 2). Although the speed reaction and temperature in the case of biodiesel is lower (which indicates greater reactivity) two negative effects are associated to the Biodiesel PM: the formation of ashes which disables the particle traps and their smaller size which makes easier its incorporation into the respiratory system.

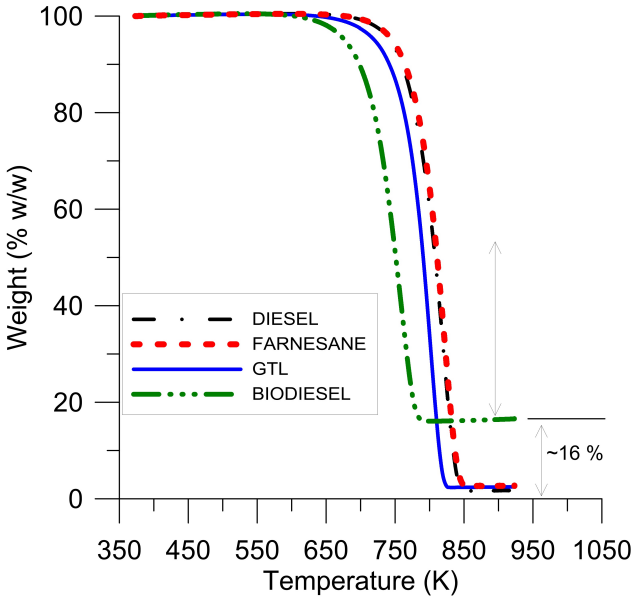

Figure 2: TGA of soot generated in Diesel engine.

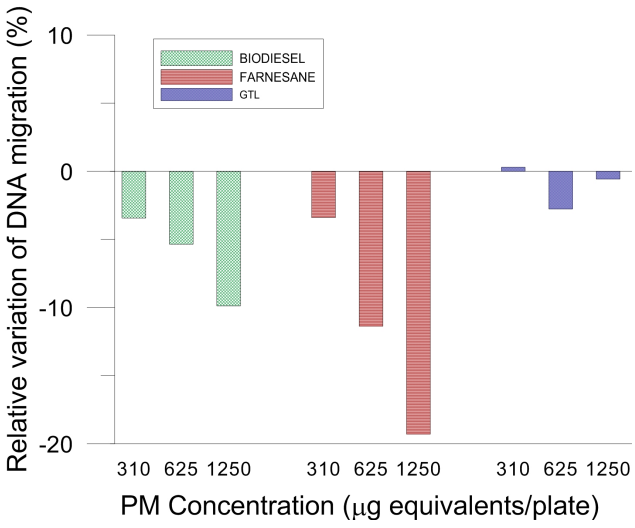

Figure 3: Relative variation of genotoxicity for alternative fuels.

Regarding biologic impact of PM, alternative fuels from renewable origin (Farnesane and Biodiesel) showed a lower toxicological risk than fossil fuels since DNA migration was reduced compared to fossil fuels [6], as it is shown in Figure 3.

Conclusions

Zero-dimensional model and alternative techniques proposed in this research has demonstrated to be very useful for calculating injection rate.

Reductions of CO, THC and PM emissions are obtained with alternative fuels. Particle matter from Biodiesel presented the highest chemical reactivity (although high ash production), but the PM emitted from Farnesane showed the lowest genotoxicity.

Notes

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Epidemiological study of inflammatory bowel disease in Cuban children and adolescents (Multicenter Study)

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Inflammatory Bowel Diseases in children are not so infrequent and a high level of suspicion should be maintained in order to achieve an early diagnosis and maximum avoidance of complications.[b]

Inflammatory bowel diseases (IBD) are chronic inflammatory processes with periods of activity, alternating with others of latency, with a wide variety of digestive and extra-digestive manifestations. Its etiology is unknown at the present time, having implicated in its etiopathogenesis various exogenous factors that would interact on an organism with a certain genetic predisposition [1–3]. When we talk about IBD, we refer to two well-defined entities: Crohn's disease (CD) and ulcerative colitis (UC), which differ basically by the location of the lesions. In UC, only the colon is affected, while in CD it can affect from the mouth to the anus. The histological alteration affects only the mucous layer in UC, and is transmural in CD. In approximately 15% of patients at the onset of the disease, it is not possible to determine whether it is UC or CD and they are provisionally called indeterminate colitis [1]. Epidemiological studies on IBD in children are limited, however in 1999 published data referred an incidence in children and adolescents of 2.2 to 6.8 per 100,000 [4]. The general incidence of CD in the population is 5.3 per 100,000; for adolescents ages 15 to 19 it is 16 per 100,000; and for those under 15 years of age, 2.5 per 100,000. The incidence of UC in adolescents under 20 years of age is 1.5 - 2 per 100,000 in Scotland and in the non-Latin part of America. In adults it affects 50 - 75 per 100,000 inhabitants. Data are lacking in children [3, 4]. The aim of this study was to determine some clinical and epidemiological characteristics of these diseases, the time of evolution at the present time, and to estimate mortality in children and adolescents diagnosed before the age of 19, in the last two decades, throughout the country.

Methods

To know the frequency of IBD diagnosis in our country, a survey was designed and sent to the different Pediatric Gastroenterology departments to include all patients diagnosed before the age of 19, with clinical, endoscopic and histopathological diagnosis of UC and CD in the last 20 years. This survey included the following variables: general data, age at diagnosis, family pathological history of IBD, forms of presentation, location of the disease, in UC the degree of endoscopic activity, time of evolution, complications, and estimating mortality. Subsequently, the medical records were reviewed in order to obtain the requested data.

Results

Eighty eight patients between 6 months old and 19 years old were reported; 73 (83%) with UC and 15 (17%) with CD. The most frequent age at diagnosis was between 10-14 years old, with a slight predominance of males in UC and females in CD. No family history of IBD was reported. The predominant form of presentation in UC was rectal bleeding (47.9%) and in CD it was abdominal pain (53.3%); perianal disease was observed in 46.6% of all cases of IBD. In UC, the most frequent location was pancolitis and grade III endoscopic activity; in CD the predominant location was ileocolic. Surgery was necessary in 46.6% of patients with CD and in one patient (1.3%) in UC. Hepatic complications represented 9.5% in UC. For all IBD patients, 33% were diagnosed in the last 5 years. Mortality was 4.1% for UC and 6.1% for CD.

Discussion

Although epidemiological studies on IBD in children are limited, almost all have suggested that the incidence (number of new cases in the population per year) is similar to or greater than that found in the adult population. In Spain the incidence is between 0.8 and 1.8 per 100,000, lower than in other European countries with urban predominance [3]. It is currently known that the percentage of patients who develop the symptoms of these diseases during childhood and adolescence ranges between 25 and 40%. Our study showed 83% UC and 17% CD among Cuban children and adolescents suffering from IBD; in almost all countries the former is found more frequently than the latter, although it is suggested that these prevalence proportions may vary according to the geographical area studied. The distribution for the age of onset is bimodal with a peak between the second and third decade and a second peak between the fifth and sixth decade, with the mean age of onset in childhood between 11 and 13 years old and 5% earlier is reported of the 5 years, which corresponds to our results; Although rare in chil-

dren under 2 years of age, there are cases described in infants, as reported in our series coinciding with other authors [3, 5]. It is argued by most authors that there are no differences regarding sex in these diseases. It has been shown that there is a family aggregation among first degree relatives of up to 20 to 25%, but we did not find this background in our study. In studies conducted in UC, symptoms of rectal bleeding with diarrhea and weight loss predominate, while abdominal pain, growth retardation and diarrhea predominate in CD, which is consistent with our results. Perianal disease occurs in 30% to 50% of children and adolescents with CD [3], so omitting inspection of the perianal area in a child or adolescent with chronic gastrointestinal symptoms may delay the definitive diagnosis of CD. Nutritional alterations [6, 7] are a form of presentation of these diseases, especially in CD in more than 30%, so a correct nutritional evaluation should not be omitted as a suspicion of them. The most frequent location observed by us in UC was pancolitis and activity grades II and III, in agreement with most of the authors. Around 60% of children with CD have ileocolitis and 20-25% have isolated ileal disease, agreeing with our results despite the small sample [2, 3]. In recent years there has been an increase in the number of patients with IBD, coinciding with a higher index of suspicion and the greater availability of endoscopic studies [1–3]. which is observed in our study where the two thirds of the patients were diagnosed in the last 10 years and of them a third in the last 5 years. CD presented a predominance of surgical complications and UC predominated liver complications, which may even precede gastrointestinal symptoms [4, 8] Although we know that colectomy in UC provides the only cure and it is accepted that the most appropriate surgical technique is ileoanal anastomosis with rectal mucosectomy and ileal sac formation, the inflammation of the ileal sac is a common problem. The indications for surgical intervention in UC are related to the appearance of dysplasia. It is stated by many authors that colectomy in children with UC has decreased significantly, a change that undoubtedly reflects improvement in medical therapies: nutritional support, broad-spectrum antibiotics and immunosuppressants, in addition to annual colonoscopic surveillance avoiding prophylactic surgery. Approximately 50 to 75% of children with CD require surgical intervention in the first 10 to 15 years after diagnosis. The main reasons for surgery are most often symptoms resistant to medical treatment and corticosteroid toxicity. Patients with ileocolitis have a recurrence rate of 70% over 5 to 10 years, compared with 15% for those with colitis alone [2]. Mortality in our series was related to liver diseases and complications during surgery. No case of colon neoplasia was reported as a complication in our patients. It is concluded that IBD are not so uncommon in our environment and that a high index of clinical suspicion must be had to make an early diagnosis and it must be followed by a multidisciplinary team with special attention to educating the child or adolescent and the family regarding the disease process, its complications and those related to treatment.

We would like to thanks all the Pediatric Gastroenterologists of the Pediatric Gastroenterology Services in the country for the collaboration provided to carry out this multicenter study.

Notes

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Irritable bowel syndrome as a cause of chronic abdominal pain

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Functional Gastrointestinal Disorders (FGID) are a frequent motive for health care needs in gastroenterology, thus causing serious problems socially and in family dynamics. We study the clinical characteristics and natural history of the Irritable Bowel Syndrome (IBS) in children and adolescents attending our outpatients' practice of pediatric gastroenterology, according to the new Rome criteria. We found that IBS is relatively frequent as a cause for functional Chronic Abdominal Pain (CAP) and that an interrogatory following Rome criteria is useful for its diagnosis.[b]

Introduction

Chronic abdominal pain is a very frequent reason for consultation, constituting between 2% to 4% of visits to the primary care pediatrician and up to 50% to the pediatric gastroenterologist [2, 3].

In clinical practice, IBS is characterized by symptoms of chronic abdominal pain and defecation disorder. Pediatric IBS can be divided into subtypes analogous to adults reflecting the predominant stool pattern (IBS with constipation, IBS with diarrhea, IBS with constipation and diarrhea, and unspecified IBS). Although bloating and abdominal distension are commonly reported symptoms, its presence is not mandatory to accurately diagnose IBS.

IBS is one of the most frequent motive of FGIDs for adolescents, representing 3% of the motives for consultation in the primary care level, with a significant predominance in female sex; Between 10 and 20% of adolescents have symptoms consistent with this syndrome. Although its higher frequency is encountered in industrialized countries, as stated in the scientific literature, this disorder also appears in the third world [4, 5].

Pathogeny

IBS, which is considered a disorder of the brain-gut axis, is a disease of complex multifactorial origin, the central characteristic being the changes in the behavior of the intestinal smooth muscle; However, this abnormal motility of the intestinal smooth muscle is not the fundamental explanation of all the symptoms, which are determined by multiple factors, including motility disorders, visceral hypersensitivity, inflammation and immune dysfunction of the mucosa, gut-brain shaft dysfunction and psychosocial factors of childhood [6, 7, 8].

Visceral hypersensitivity may relate to the child's psychological distress (anxiety, depression, impulsiveness, anger). An intense serotonergic pathway has been identified involving 5HT3 receptors in the intrinsic nervous system. These receptors are considered key in the perception of abdominal pain and in the regulation of gastrointestinal motility, which will lead to new treatment goals. Increased mucosal proinflammatory cytokines have been demonstrated and may be induced as a consequence of an acute infectious gastroenteritis (postinfectious IBS). Alterations in gut microbiome have been demonstrated, although it is not clear if these changes are the cause or result of IBS and its symptoms [6, 7, 9]. Noxious early life events, e.g. surgery, have been associated with a higher risk for developing abdominal pain in childhood, including IBS [3, 10, 11].

Methodological Aspects

Our aim was to determine the clinical characteristics and natural history of IBS in children and adolescents attending our outpatients' practice of pediatric gastroenterology, according to Rome criteria.

In the way to analyze the ultimate aspects in IBS diagnosis and treatment, and its relation with CAP, some documentary databases and registers were revised. Particularly, PubMed, Scielo and Latindex documentary databases and the Cochrane Specialized Register. The data related to irritable bowel syndrome until December 2017 were analyzed, as well as the treatment guidelines presented by different medical organizations based on the criteria of Rome and of Evidence-Based Medicine.

In order to know the frequency of IBS in our ambulatory consultation of pediatric gastroenterology a questionnaire and some tests were applied to all outpatients with CAP diagnosis within a 3 years period. In their first visit a questionnaire for symptoms was to be filled out by patients and/or parents or tutors and a complete physical examination was performed. The following tests were performed in all patients: hemogram, erythrocyte sedimentation rate, biochemical tests for tissue transglutaminase antibody, microbiological and parasitological examination of the feces, occult blood in stools, urine culture, electroencephalogram, metabolic tests in urine, upper gastrointestinal endoscopy and anathomopathological study as well as abdominal ecography to screen for organics causes. Patients meeting IBS criteria were selected. These data were loaded into a Epinfo-6 program. Percentual distribution was the selected statistic method.

A review of the subject referring to childhood was carried out, and the most accepted concept and pathogenesis were included, as well as Rome criteria established for the diagnosis. Etiology, clinical diagnosis and diagnostic tests were emphasized. Some aspects of the treatment were analyzed.

According to Roma criteria the diagnosis is supported by a normal physical exam and growth. During the initial visits, the psychosocial history of the child and the family should be specified, it is necessary to establish a nutritional history, if there is an adequate intake of fiber in constipated patients, or an ingestion of sugars such as sorbitol and fructose in diarrhea. Bacterial gastroenteritis may be followed by the development of IBS in 5-10% of patients depending on the severity of the initial episode and the previous state of anxiety or depression [12, 13]. It should also be questioned about family dynamics, since there are studies in which it has been shown that adult patients with this pathology report a history of child abuse (physical, emotional and sexual) [10, 11]. It is necessary to be alert to warning signs of illness such as pain or diarrhea at night, weight loss, rectal bleeding, fever, arthritis, delayed puberty, etc.

Results

A total of 343 patients with functional CAP were considered, 41 (11%) of them with IBS, ranging between 5-15 years (mean 9.5) while the 53.6% ranged between 5-9 years; 22 (53.7%) were males and 19 females (46.4%). None had family history of IBD. The abdominal pain or discomfort was located in the hypogastrium in 28 (68.3%) and 13 in the periumbilical region (31.7%); 21 (51.2%) presented diarrheas, 8 (19.5%) constipation and 12 (51.2%) diarrhea and alternate constipation, 30 relief with defecation (73.2%); Giardiasis 9 (22%). A 12.2% presented malnutrition and 12.2% obesity. The time of evolution ranged between 3 months and more than 2 years, with 31.6% prevailing in more than one year.

Conclusions

IBS is relatively common as a cause of CAP, and questioning conducted according to Rome criteria is useful for diagnosis. For the majority of patients with IBS symptoms the Rome criteria showed to be useful as a diagnosis and follow up method. We consider that IBS is relatively frequent as a cause for functional CAP and that an interrogatory following Rome criteria can improve its diagnosis. Most children with IBS should be managed this way by primary medical care.

Notes

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