

Photodermatology. Quo vadis?

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Abstract. Erythema was not always a good parameter for acute solar damage and is much more difficult to use in darker skin types. While in the past photodermatology was mainly focused on Caucasian skin, the future, therefore, could be completely different. In addition, skin colour has not only a protective importance but also a social importance. This is another factor that should be taken into account. Photodermatology and the classification of photodermatoses will also become more globalised in the future. Challenges for phototherapy will be a reduction of the irradiation time and the number of treatments, and the development of specific light sources for specific indications. Phototesting should be standardised on an international level and this will lead to a growing need for an International Society for Photodermatology. Until now, most treatments have been rather symptomatic. There are also more and more reasons to believe that more active treatments could play a role in the future.

Key words: skin type, photodermatoses, phototherapy, phototesting.

FOTODERMATOLOGÍA. QUO VADIS?

Resumen. El eritema no fue siempre un buen parámetro para valorar el daño solar y es más difícil de utilizar en fototipos más oscuros. Mientras que en el pasado la fotodermatología estaba centrada en la piel caucásica, el futuro puede ser completamente diferente. Además, el color de la piel no sólo tiene un papel protector, sino también una importancia social; este es otro factor a tener en cuenta. La fotodermatología y la clasificación de las fotodermatosis estarán más globalizadas en el futuro. Los desafíos para la fototerapia serán una reducción del tiempo de irradiación y del número de tratamientos y el desarrollo de fuentes de luz específicas para indicaciones concretas. Las fotopruebas deberán estandarizarse internacionalmente y esto dará lugar a la creciente necesidad de una Sociedad Internacional de Fotodermatología. Hasta ahora, la mayoría de los tratamientos han sido más bien sintomáticos. Hay también más razones para creer que otros tratamientos más activos puedan tener un papel en el futuro.

Palabras clave: fototipo, fotodermatosis, fototerapia, fotoprueba.

Photodermatology started with the study of the solar spectrum. Then came the description of different photodermatoses, and much later the use of solar irradiation and phototherapy in the treatment of skin diseases. Photoprotection is a more recent evolution.

Spain and Photodermatology

Photodermatology has a very long history in which Spain did play an important role. In 1735 Gaspar Casal first de-

scribed pellagra. As far as we know, this is the first description of a photodermatosis. The disease was called “mal de la rosa” because all patients had a typical reddish and glossy rash on the dorsum of hands and feet. Casal not only described the disease but also made the relationship with poverty and lack of meat¹. When maize (American corn) was introduced in Europe, its use as a staple crop gradually spread from the Iberian Peninsula to Eastern Europe, because food calories per acre greatly increased as compared to rye and wheat. Maize became the main source of energy for poor people². Niacin and tryptophan in maize are bound and therefore have poor bioavailability. The increased use of maize was responsible for the increased incidence of pellagra. Pellagra was the scourge of Europe and the United States for two centuries³.

When Casal first described pellagra, not much was known about the solar spectrum. It was 73 years after

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Newton published the results of his experiments in 1672 when the visual spectrum of the sun was fractionated into the different colors of the rainbow. It was still 66 years before the ultraviolet (UV) rays were discovered by Ritter in 1801.

Another field where Spain played an important role in photodermatology, was the study of porphyrias at the Department of Dermatology of Barcelona Medical School. The study of porphyrias in Barcelona began in 1948 with Joaquim Piñol i Agudé. The first cases of porphyrias were reported in 1950 and 1952. As the interest in porphyrias was growing a small research team was founded. It initially consisted of Antonio Castells-Mas and Catherine Galy-Mascaro, who controlled the patients clinically, José M. Mascaró, who studied the pathology, and Mario Lecha, who made the photobiological tests. During the period between 1969-1970 the Barcelona Porphyria Research Group already studied 63 patients, and by the end of 1981 the total number of patients was 380⁴.

All these data show that Spain did make an important contribution to the history of photodermatology. Nowadays photodermatology is an important part of dermatology with many different subareas.

Erythema and Skin Type

For a long time after the discovery of ultraviolet rays by Ritter in 1801, it was a common belief that the heat from the sun was responsible for erythema and tanning. It was only in 1858 when Jean Martin Charcot in France proved that solar-induced erythema is really induced by ultraviolet rays, and it was only in 1885 when Paul Unna in Germany could show that ultraviolet radiation of the sun was also responsible for tanning. In the meantime, a lot has been published about erythema, pigmentation and natural photoprotection.

Until now acute solar damage has always been evaluated by using erythema as the parameter. The reason probably is that erythema is a parameter easy to use. By determining a minimal erythema dose (MED) erythema can be graded. However, there are several drawbacks. Measuring erythema only gives a partial idea of acute solar damage. If erythema is used as a parameter to evaluate photoprotection, especially protection against UV-rays, erythema is measured. It was shown that a much higher protection is needed to prevent UV-induced immunosuppression than to prevent UV-induced erythema⁵. This means that in the future other parameters should be used as well to evaluate solar damage. This will be necessary not only to have a better and more complete idea of UV-induced damage but also to have a more realistic approach in photoprotection.

Another problem is that erythema can be used in Caucasian skin but it is much more difficult in darker skin types. While in the past dermatology and photodermatology were mainly focused on Caucasian skin, the future can be completely different. We have to take into account all different skin types. We now use skin typing because we do not have anything better, but in practice the use of skin types has several disadvantages. It would be interesting to look for other ways and methods to determine one's susceptibility to solar irradiation, on the short term as well as on the long term. Skin typing has a prognostic value because it gives us an idea about later risk for skin cancer. It is very difficult to know whether this is a valid parameter or not. Because, theoretically, someone can get skin cancer without ever having erythema, it may not be a good parameter as it has been accepted until now. It is not because the action spectrums are similar or comparable that there necessarily should be a good correlation. Many other factors may play a role. Genetic factors may be important but also yet unknown factors, which could explain the difference from one person to another in the same family. This will be a challenge for the future because it will become even more important to have a very good idea about the risk for skin cancer.

Pigmentation and Photoprotection

Pigmentation has always been correlated with photoprotection. Our skin colour is probably the result of a natural selection during the evolution of mankind. Sun exposure and photoprotection were probably very important elements in evolution. Even if there were no major differences in skin type as we know them nowadays, our ancestors with a more pale skin would have encountered a lot of challenges in sunny climates, while those with darker types would have had a higher probability of vitamin D deficiency if they lived in less sunny parts of the world. This could have led people with paler skin types to live further away from the equator and the dark-skinned ones closer to the equator. Photoprotection by skin colour in such circumstances was more a matter of survival.

Nowadays, skin colour has not only a protective importance but also a social importance. A lot of people are not happy with their skin colour. This was partly the result of travelling but more recently also from all the improvements in the way we can communicate with each other. People are comparing their skin much more than previous generations did. Many people with a Caucasian skin type would prefer to have a more darker type. They do exaggerate with solar exposure in order to obtain a tan. They use sunbeds and try to accelerate tanning. This is also partly the result of fashion. On the other hand, darker skin types would like to have a paler skin. They use clothing and sunscreens to

keep their skin as pale as possible, in order to prevent an even more pronounced tanning. As a result those who not necessarily need a very good photoprotection, are using an adequate photoprotection and those who really need it, do it inefficiently. It will be a very difficult challenge in the future to change this, because many people are more sensitive to fashion than to medical facts. The cosmetic industry could play an important role here. For dermatologists it will not be easy to keep all this in a good direction where common sense and evidence-based practice are the guidelines.

The Classification of Photodermatoses

There will also be a change in the classification of photodermatoses. When talking about photodermatoses, we mainly consider photodermatoses in the Caucasian populations. Most textbooks until now deal mostly with Caucasian skin. However, the type of photodermatosis that dermatologists have to deal with in their daily clinical practice can be completely different from one continent to another. A very common photodermatosis in Europe, such as polymorphic light eruption, can be rare on another continent. More frequently encountered photodermatoses on these continents can be rare on those continents where polymorphic light eruption is frequently seen. Dermatology and also photodermatology will be more globalized in the future. This can be an interesting evolution because it could help us to find out why there are so many differences and it could stimulate us to do much more research on the mechanisms of all these different diseases. In the same way as travelling and the first encounters with people with other skin colours were important elements into the research of skin pigmentation, comparison of different photodermatoses on different continents could also be an important element stimulating interest into the pathogenic mechanisms.

Terminology and classifications are partly artificial but on the other hand they are needed to classify the different photodermatoses. The main reason to do this is to be sure that everybody is talking about the same disease. There are still many difficulties in dermatology but also in photodermatology. Until quite recently this was not a major problem because in a particular country most people were talking about the same disease when using a particular name. However, in recent years it turned out that the same disease can be described in different countries under a different name. People living in these countries do not always realize that this is a problem, but if an outsider is involved it can become more difficult. Because of nationalistic pride and tradition, it is not always easy to change this. In the future it will be unavoidable to use an international classification system that will be acceptable for everybody. If

this would not be the case there will be other series of publications using a new name for a condition that has already been described somewhere else under a different name. This will make photodermatology much more complicated than it should be, especially for younger colleagues. We nearly all have access to a huge amount of information from all over the world, but there are still a few difficulties to overcome. The first one is that we have to be more open minded towards colleagues in other parts of the world. From nationalistic points of view or from tradition we may have a feeling of superiority towards neighboring countries or other parts of the world. We should become more modest and more open minded to other colleagues opinions. Because most medical doctors have an individualistic mentality, this will not always be easy.

Another difficulty will be the way of communicating. Although we have access to an enormous amount of information in a very short time period, language can still be a problem. English is now regarded as the main language in science and definitely in medicine, but we do not realize enough that not everybody has enough knowledge of English to use it as the main key for worldwide information. The key language not necessarily has to be English, but the language used by most dermatologists as their first or second language, is definitely English. Although this should not necessarily be the case in the future, it will be so for the next generation. If the goodwill to learn English as a second language is lacking, one will become isolated without even realizing it. It does not mean that we have to abolish our own language and our own culture. A beautiful example is the European Society for Photodermatology. In Europe we have so many different languages and cultures and we each may be proud of it. Different countries have their own photodermatology societies. Being open minded, these different photodermatology societies are also participating in one European Society for Photodermatology. The one, therefore, does not exclude the other. But this is just Europe. It will be more difficult to do this on a worldwide scale, and even if this would be much more difficult, it will be a natural evolution. We just need a language and an open mind without any feeling of superiority. The last element will be the most difficult one. In general, dermatologists are medical doctors with a good character and, therefore, this will theoretically be possible.

Light on Phototherapy

The evolution of phototherapy has been in episodes. After the discovery of the visible spectrum of the sun by Newton in 1666, it took nearly another century and a half before the invisible parts of the solar spectrum were discovered, the infrared spectrum in 1800 by Herschel and the ultraviolet spectrum in 1801 by Ritter. The major breakthrough

came with the Nobel prize for Finsen in 1903, the only Nobel prize ever awarded for dermatology. The Nobel prize was awarded for Finsen's therapeutic results with phototherapy for lupus vulgaris and was the start for phototherapy in all major dermatology departments inside and outside Europe.

Another important episode was the start of photochemotherapy (PUVA treatment), topically in 1970⁶ and orally in 1974⁷. In the meantime we regularly have seen new phototherapy modalities, such as UVA1 phototherapy using high doses of UVA1 and photodynamic therapy using visible light. All means to improve efficacy and safety are welcome. This can be done by development of new light sources, where we like to use only the necessary wavelengths and avoid the most damaging ones, in the way it has been done with narrowband UVB phototherapy for psoriasis. We probably need specific light sources for specific indications. With the technical and innovative possibilities we have nowadays, this should be possible. It will mainly be a financial problem.

Other challenges will be a reduction of irradiation time for each session and also a reduction in the number of treatments. An interesting approach is the use of photosensitizers. The side effects encountered with the combined use of psoralens and UVA irradiation, have long blocked all further interest in the use of photosensitizers. More recently, photodynamic therapy combining other photosensitizers with visible light irradiations makes this approach again more interesting. It could induce a new Renaissance period for phototherapy. If the necessary means are available, we probably might expect many more bright episodes in phototherapy in the future, possibly in totally different indications than the ones we are using today. It is again mainly a matter of effort and money.

Dosimetry and Phototesting

Dosimetry may still be a problem. There was a time when 1 J/cm² was not 1 J/cm² everywhere. This was due to differences between different UV meters⁸. Such pitfalls could always arise when using new types of phototherapy. It is of vital importance to avoid such differences because otherwise switching from one lightbox to another could give problems. Comparing therapeutic results or experimental results is impossible when different UV meters do not give the same value.

Dosimetry is also essential for phototesting. Still a lot can be done to improve the equipment for phototesting and to reduce irradiation times. This is not just a question of money but also of practice. From this point of view there should be more cooperation between photodermatologists and medical physicists, as is already the case in some countries. It is not enough to standardize dosimetry on a local

level. It should be done on a much larger scale. It is already difficult to arrange this in one country, but to do this on a more international scene becomes even more complicated. Nevertheless, it will be necessary for the scientific impact of photodermatology and also as a way of standardizing what we are doing. How this has to be arranged is another matter. Probably the most logical way is by founding a real international society for photodermatology, where the already existing national photodermatology societies could participate. A condition would be that all continents will participate in such a society. How successful such an approach will be, mainly depends on everybody's goodwill.

Towards an International Society for Photodermatology?

A real international society for photodermatology could also be very interesting as an information source. We do not know enough about the different photodermatological problems encountered on different continents. Even during world congresses, photodermatology is only a small part of the program and mostly deals with problems seen in Caucasian skin. Opening frontiers could make the information much more accessible to everybody, where each one could learn a lot from each other. Continental websites could thus offer information about specific photodermatoses in specific skin types. Epidemiological studies could then be organized to compare the incidence of different photodermatoses on different continents. The scope of photodermatology is a dynamic process and, therefore, many changes have to be expected in the future. It may happen that some frequently encountered photodermatoses suddenly become much less frequent seen. An example are the persistent light reactors seen in the 1960's. On the other hand, new problems may arise because new drugs are commercialized continuously. Although the photosensitivity screening of new drugs is much better than ever before, the risk cannot be completely excluded.

As new dermatoses do appear from time to time, it seems logical that also new photodermatoses may arise. Information is passing much more quickly than ever before, which may suggest that such new photodermatoses may be spotted much easier and sooner than before, and that they can also be diagnosed and treated easier. There also could be changes among already well-known photodermatoses. In Belgium we see much less chronic actinic dermatitis patients than before and, on the other hand, we have more patients with solar urticaria than ever before, and all this without any obvious explanation. In addition, a different spectrum of photodermatoses is to be expected in the future because people from different continents are mixing more and more. Photodermatoses that are com-

mon in Africa and rarely seen in Europe may thus become more frequent in Europe. On the one hand this will make our job more complicated but on the other hand, also more interesting. All these new problems will be a challenge stimulating the right classification and terminology, the means and criteria for diagnoses, further research into the pathogenic mechanisms of these disorders and also ways to find an appropriate treatment. This last factor may be a challenge on its own, because an appropriate treatment will not automatically mean that the treatment will be appropriate everywhere. Not much research has been done on the effect of a particular treatment on different skin types. It could be that we will not only need specific treatments for specific photodermatoses, but also different treatments for different skin types. It could also be possible that we need different treatment schedules when using the same treatment for different skin types, as is already the case with photochemotherapy and phototherapy for psoriasis and other indications.

From Symptomatic to More Active Treatments

Until now most treatments have been rather symptomatic decreasing those symptoms that are most annoying but in many cases not giving a final and definitive solution. There are more and more reasons to believe that more active treatments could play a role in the future. If we could synthesize the appropriate enzymes it could theoretically be possible to have more long-lasting results in the treatment of certain porphyrias. If we could know exactly why a particular drug is photosensitizing in one patient and not in another, we could possibly play a more active role in the treatment of these disorders. Many recent studies suggest that polymorphic light eruption is partly due to a reduction in UV-induced immunosuppression. If it would be possible to clear out this mechanism even more in detail, it could theoretically be possible to influence this balancing effect of UV on UV-induced immunosuppression. A lot more information is also needed on genetic influences. Even if a more active role could be played in the pathogenic mechanisms, the limiting factor will always be possible side effects.

The Patient Becomes a Doctor

Although our colleagues in the future will have much more possibilities than we have, it will not necessarily mean that their job will be easier. Until quite recently the information the patient had came from his treating dermatologist. Some patients did consult textbooks but even then the information was quite difficult to interpret for them. Nowa-

days this is all history, and everybody can have a lot of easy- to- read information on internet. This information is easily accessible, but the problem of interpretation remains. However, many patients already give the impression that they know enough about their disorder and sometimes even that they know it better than their treating dermatologist. It is very difficult to realize how this will be in the future but if this tendency goes on, it will become more difficult for our future colleagues. Of course we can always find the right arguments to convince our patients, but this could also become more and more time-consuming. A second problem could be that our patients will always have more and more and better and better information, and then we too need this updated information. The main problem will be the timing of this information. If the patient has the information before the medical doctor, then it can be a very unpleasant situation.

Photodermatology Becomes a Large Family

The increased interest in all the effects related to sun exposure on the human body not only appeals dermatologists alone but also other colleagues. If this interest goes on, then photodermatology may even play a much more important role than it has played until now. Photodermatology could thus interact with many other disciplines in medicine, where the skin acts as a major organ. This will not only make our work much more important but it may also open completely new horizons. A good example is the interest in vitamin D and its preventive effect in certain cancers. There could be a risk that the dermatologist is losing hold on all these effects, and therefore cooperation with other disciplines may be necessary. This is not a new idea because years ago the journal *Photodermatology* has been renamed *Photodermatology, Photoimmunology & Photomedicine*. This could have been a coincidence but it probably was more than that. We can only guess if this evolution will go on. However, all the discussions about vitamin D and sun exposure, with their advantages and disadvantages, may suggest that the future already started.

Photoaging Becomes a Medical Problem

As long as mankind exists, several methods have been tried out to keep one's skin as young as possible. This is not new but we now have a much wider interest in this topic because people are living longer. Nobody likes to become old and, therefore, looking younger will become even more attractive, and thus also the condition of the skin. If it would become possible to live longer in the future, then this element could become more important. What we now

consider as cosmetology, could then become a real medical problem. Photoaging automatically means immunological aging. This is not only a question of malignant and premalignant lesions, but also a question of infections, both viral and bacterial ones. The longer people will live, the more important these elements will become. Perhaps many more actors might play a vital role in the pathogenesis of malignant lesions than we realize until now. This is already suggested by the complex problem of the pathogenesis of malignant melanoma and the role of UV exposure in this pathogenic mechanism.

How important could be the role of sun exposure in a variety of different types of infections has not been well studied enough until now. It could help us to explain individual differences in susceptibility to infections, but it could also have possible therapeutic consequences. Increasing problems of resistance of certain bacteria against certain antibiotics and the need to use more and more potent antibiotics, with all possible side effects, open the door to the use of different types of solar irradiation in the prevention and treatment of infections.

A Different Kind of Training

Another challenge for the future is training in photodermatology. It is important that the knowledge one acquires in photodermatology can be passed to younger colleagues. As a result, different courses in photodermatology have already been organized in different countries. These courses are usually very successful, which not only means that there is a lot of interest but also that there is a need to organize such courses. An interesting evolution is that these courses are organized not only with local photodermatologists, but more and more in cooperation with photodermatologists from abroad. This opens views and can also be a stimulus for quality. In the future there will be a growing need for such courses and also for courses organized on an international level. Because photodermatology is still a small subspecialty in dermatology, there is always a problem of distance. With the travelling means we have nowadays, the distance itself is not the major problem anymore but the cost of travelling is. Telemedicine can be a solution but is still quite expensive. Courses on CD-ROM can help a lot. However, direct contact between the teachers and the audience is still and will remain important. Another solution could be a course which is travelling around, as it already exists in some countries.

Databases

Although articles in journals and chapters in textbooks still remain an important part of the training in photoder-

matology, it is far from evident that this will remain so in the near future. An interesting approach would be that large databases with clinical photographs can be consulted by colleagues everywhere. Such databases could be made by national and also by overlapping international societies for photodermatology. Using such databases could be a good way for discussing certain photodermatological problems and could also be used as didactic material in photodermatology teaching, on condition that privacy of the individual patient is respected.

For very common photodermatoses such a database will probably be less essential, but as already been mentioned before, very common photodermatoses could be quite rare on other continents. Having such a database becomes more interesting when we have to deal with photodermatoses that are less frequently seen or that are very rare. Clinical pictures of such photodermatoses can now be quite difficult to obtain. By starting databases, rare material becomes more accessible which means that a lot of questions will arise from different parts of the world. This can be a stimulus for further interest in epidemiology, clinical symptoms and pathogenic mechanisms of all these different photodermatoses. When the diagnosis becomes more evident it will also have a positive result on our different classification systems and automatically on possible treatments. Even when a treatment is available, it is not always evident to use it in the right way, mostly due to the lack of practical experience. Not all information is published and some very practical information is not published at all because the treating photodermatologist takes it for granted and does not find it interesting enough to have it published. At international and even at local meetings not much time is left for discussing difficult photodermatological cases. In addition, not all people that are interested in these cases are present at such meetings. As a result, much information is lost or is not available. By having a large international database many of these problems could be overcome. It will not be an easy job to organize such a database but again it will be a question of goodwill.

Conclusion

We have to realize that we are only passengers in the wide world we are living in. The knowledge we have was built on the different bricks that were laid by our colleagues before us. If we love our job, we have to build the bricks as a foundation for our colleagues in the future. This will be the best we could ever give them.

Conflict of interest

Author has no conflict of interest to declare.

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