NECK DISSECTIONS: MISCONCEPTIONS, MALPRACTICE AND COMMON CONTROVERSIES

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[Svuotamenti latero cervicali: convinzioni errate, pratiche scorrette e controversie diffuse]

SUMMARY

Background. Neck metastases are the single most important prognostic factor in Head and Neck Squamous Cell Carcinoma. Wise approach to neck treatment is then mandatory to give a chanche for cure.

Still, there are some issues about neck dissection that need to be clarified.

Methods. Through a review of the literature and of everyday clinical observations, the following issues are discussed: Functional Neck Dissection, biopsies, nodal levels, Selective Neck Dissections, Spinal Accessory Nerve, neck dissection classification.

Results. Integration of historical, anatomical, clinical and surgical concepts and up-to-date knowledge can allow to understand how to behave in diverse clinical situations.

Conclusions. Standardized guidelines are far to be achieved. Wise behaviour, however, may allow to avoid some mistakes. The aim of this paper is to make the above mentioned issues clear and hopefully give more diffusion to concepts that too often seem to be overlooked.

Key words: Neck dissection, neck biopsies, nodal levels, functional neck dissection, spinal accessory nerve.

RIASSUNTO

Introduzione*. Le metastasi laterocervicali sono il fattore prognostico isolato più importante nei carcinomi spinocellulari del distretto cervico-cefalico. Il trattamento opportuno del collo è dunque fondamentale per la cura di questi tumori.*

A tutt'oggi esistono argomenti riguardo lo svuotamento del collo che vanno chiariti.

Metodi. *Attraverso una revisione della letteratura integrata con osservazioni della pratica clinica quotidiana, vengono discussi i seguenti punti: svuotamento funzionale, biopsie, livelli linfonodali, svuotamenti selettivi, nervo accessorio spinale, classificazione degli svuotamenti laterocervicali.*

Risultati*. L'integrazione di concetti storici, anatomici, clinici e chirurgici insieme all'aggiornamento continuo permettono di affrontare correttamente le diverse situazioni cliniche.*

Conclusioni*. Linee guida standardizzate sono ancora lontane. Un approccio metodico può comunque consentire di evitare alcuni errori. Lo scopo di questo lavoro è chiarificare i punti discussi nel tentativo di diffondere concetti che troppo spesso appaiono trascurati.*

Parole chiave: *Svuotamento laterocervicale, biopsie nel collo, livelli linfonodali, svuotamento funzionale, nervo accessorio.*

Article

The Head and Neck region contains about one third of the lymphatics of the whole body and Squamous Cell Carcinomas, 95% of Head and Neck cancers, have regional metastatic involvement in about 50% of cases at the time of diagnosis[17]. (From this point on, the term head and neck cancer will refer to squamous cell carcinomas).

Furthermore it has been proved that locoregional control is the single most important factor affecting prognosis in Head and Neck cancers[18,21,22,40].

For these reasons, wise approach to the neck is mandatory in the treatment of Head and Neck Squamous cell carcinomas.

Unfortunately, even if it is universally accepted that neck dissection is of paramount importance in the treatment of head and neck cancer, there is still much confusion regarding terminology, surgical procedures and significance of the neck.

This review is not meant to give guidelines for neck treatment. Its purpose is to discuss, and hopefully clarify, some issues that are too often overlooked or mistaken by physicians about:

- Historical and conceptual development of Neck dissection;
- Functional Neck dissection;
- Biopsies;
- Nodal levels;
- Selective Neck dissections;
- Spinal accessory nerve;

• Neck dissection classification.

This review is addressed to Phisicians in general, not just to head and neck surgeons, because not only surgeons, but also radiologists, oncologists, radiotherapists, anatomists and other specialists are involved in the multidisciplinary approach to head and neck cancers.

These issues will be discussed point-by-point below.

Brief historical and phylosophical introduction

That the neck was of crucial importance in the treatment of head and neck cancers was first understood by Chelius in 1847[9,15]. Many reports then followed advocating the need for neck dissection in Head and Neck cancers[15] until Crile first published its description of neck dissection in 1905[10] and then in 1906[11].

Crile advocated removal of all the lymph-node bearing tissue of the neck and, in a series of 132 neck dissections, achieved considerably higher survival rates than in patient who didn't undergo neck dissection.

Crile also advocated a "block" operation, like Halstedt did[11]. In many other things the history of neck treatment reminds that of mastectomy, from a radical, block, operation, to the actual Selective procedures and maybe to Sentinel Node Biopsy in the near future.

The key to understanding neck surgery is to understand how and why it evolved.
Evolution of neck surgery came when systematic, surgical and functional anatomy of the neck were integrated to understand anatomy, physiology and surgery of the lymph-nodes of the neck with respect to cancer biology.

As many other cases, concepts were already available but they weren't given proper consideration and they were not put together for long time.
These concepts will be discussed in the text.

Functional neck dissection

There is still much confusion regarding Functional Neck Dissection. Many still call Functional Neck Dissection what nowadays is generally agreed to call Modified Radical Neck Dissection. Nomenclature is not the subject under discussion however.

Functional neck dissection is a clear example of how classical and surgical anatomy may integrate to further improve efficacy of neck dissection.

Suarez, an argentinian surgeon and anatomist, was able to integrate already existing anatomical concept with its surgical expertise to develop the concept of Functional Neck Dissection. From the works of Truffert[42] and Pernkopf[32] he understood that the neck lymph-nodes were enveloped between two fascial layers. Coupling this knowledge with surgical anatomy he developed Functional Neck Dissection.

Functional Neck Dissection is not a modification of Radical neck Dissection which spares the non-lymphatic structures of the neck. It is a completely new approach to the neck through fascial spaces[14,16]. The deep and superficial fasciae of the neck are then the planes of dissection.

All the lymph nodes of the neck are contained within these two fasciae. This has two important implications:

1. Sacrifice of non-lymphatic structures is not necessary if not directly infiltrated by extracapsulated lymphatic metastases. From this the name functional: function is preserved by sparing nerve, muscle and vessel.

2. Neck dissection can give a reasonable chance for cure. The inclusion of all the lymph nodes between two fasciae warrants radicality. This situation is unique in the whole body. All the other lymph node dissections can only be made for staging purposes because dissection of all the lymph nodes is not warranted as it is in the neck[7].

All this without affecting oncological safety. Functional Neck Dissection was then the first step of understanding neck anatomy towards a less invasive but equally safe and radical surgery. Namely, this first step was integration of anatomical and surgical knowledge. The direction of this step was selective removal of lymph nodes at potential risk for metastatic involvement avoiding unnecessary sacrifice of uninvolved structures.

Functional Neck Dissection as popularized by Bocca[2] was as effective as radical neck dissection in loco-regional control of cancers of the larynx, mainly N0. He then described the first Selective Neck Dissection that corresponded to the future Anterolateral Selective Neck Dissection, now called Selective Neck Dissection (II-V)[34].

This because he did not dissect the submental lymph-nodes, the facial vessels and submandibular glands[8]. This is why, nowadays, the term functional is not applied anymore to a radical neck dissection that spares the spinal accessory nerve, the jugular

vein and the sternocleidomastoid muscle (Modified Radical Neck Dissection with preservation of the spinal accessory nerve, jugular vein and sternocleidomastoid muscle).

Biopsies

Virchow[43] was the first to postulate that cancers spread through lymphatics. That the lymphatic flow was orderly and metastaitc spread predictable was then described by Waldeyer[44,45].

Correlation with these information and cancer biology and surgery was only made by Hayes Martin in 1944[26]: "Incisional biopsy for the removal of a portion or of the whole of a cervical tumor should never be made until other methods have been unsuccessful.

One of the most reprehensible surgical practices is the immediate incision or excision of a cervical mass for diagnosis without any preliminary investigation for a possible primary growth. There can be no better example of ill-advised and needless surgery". Hayes Martin was the one who described fine needle aspiration cytology in 1930[25].

This because any procedure that violates the neck, thus disturbing lymphatic flow, is it gross metastatic disease, surgery or radiotherapy, alters the flow giving rise to unpredictable lymphatic spread.

Predictability of metastatic spread is a great tool that must be exploited.

Today, too many times lymph node biopsies are still used as the first step in the diagnostic approach to a neck mass.

Biopsies must only be reserved to cases of lymphomas and must only be the last step in the diagnostic assessment of a neck mass[7].

Some may argue that this statement seems to be in contrast with one of the most useful staging tools currently used for breast cancers and malignant melanoma, currently under investigation also for head and neck squamous cell carcinoma: Sentinel Node Biopsy.

But this is a mistake. Biopsies are incorrect when used as the first and only step in the assessment of a neck mass. A neck mass could have systemic and infective causes, be primary, secondary, be the first presentation of an unknown head and neck cancer. When other diagnostic tools are available to reach the diagnosis, biopsies are unnecessary, and they must be avoided. If other diagnostic methods fail, the biopsy becomes necessary to diagnosis and it can be used. But they are the last resort.

Things are different for Sentinel Node Biopsy. Sentinel Node Biopsy will be useful in N0 necks as an extremely sophisticated tool to detect micrometastases that no other currently available diagnostic tool could detect in such an early phase.

It is not meant to investigate a neck mass Unnecessary neck dissections will then be avoided in the presence of a negative sentinel node.

Deleterious waits-and-see will be avoided, and clearance of neck nodes will be done in an early phase if the sentinel node is positive.

These advantages are much greater than the potential damage that unnecessary violation of the neck may cause. Furthermore, in the case of Sentinel Node Biopsy, violation of the neck is not unnecessary as Sentinel Node Biopsy is the ONLY tool that allows detection of micrometastases. Thus it is justified.

Sentinel Node Biopsy for head and neck cancer is subject of investigations and debate and seems to be acquiring an increasingly relevant role[20,30,35]. Maybe in the near future it will become part of the staging protocol for head and neck cancer.

Nodal leves

Classic anatomical descriptions of lymph node groups describe them by location. This description does not give any useful direction for diagnosis or treatment.

When anatomic and surgical boundaries were put together with the functional role of each lymphatic region the level concept was born.

The first who understood that specific primary sites drain, and thus give metastasis, to specific lymphatic regions was Lindberg[24], who retrospectively analyzed 2044 patients.

Such a finding would have meant that routine removal of all the lymph nodes of the neck may not be necessary in selected cases. Bocca, in 1984[2], demonstrated that this was true for cancers of the larynx.

Another huge retrospective analysis followed which deserves mention. Molinari, form the "Istituto Nazionale per lo Studio e la Cura dei Tumori" (Milan, Italy) in 1977[28] published the level concept 4 years prior to the Memorial Sloan Kettering Cancer Center[36], describing a division of neck lymph nodes very close to that of 2001[34], also identifying the sublevels 24 years before their

appearance. He also published one of the largest series ever, with 3700 cases.

The significance of identifying levels and patterns of spread has two main clinical applications:

• given a known primary, we are able to know were to expect metastasis. This gave the bases for selective removal of the lymph nodes at higher risk for metastasis;

• in case of a mass in the neck, its location will guide us in looking for an eventual unknown primary.

Molinari's fault was that of having published its series in an Italian Journal.

The neck division into level was then popularized in the English-speaking world when Shah did a similar analysis and divided the neck into seven levels[36,37,38].

In 1991, in response to a need for standardization, a committee form the American Head and Neck Society and the American Academy of Otolaryngology-Head and Neck Surgery, lead by Robbins, published a division of the neck into six levels[33] later revised to further divide the levels into sublevels – obtaining nine levels like Molinari[28] did, to revise the nomenclature of neck dissection, and to introduce radiologic landmarks for identification of the levels.

Selective neck dissections

If a given primary metastasizes with high probability only in certain levels, and gives metastases to the other levels only in rare, advanced cases, will there be a role for a less invasive operation with less discomfort to the patient, higher quality of life and equal cure rate?

As it happened with mastectomy, with the improvement in Overall Survival and Disease Free Survival, more attention was being given, and so is still, to Quality of Life. Less invasive operations were developed that limited sequelae without affecting cure rates.

For this, operations that spared the Pectoralis Major and Minor Muscle without negatively affecting prognosis, or quadrantectomies, or Sentinel Node Biopsies were developed. Similarly less invasive neck dissections that spared not only non-lymphatic structures, but also some nodal groups, and even Sentinel Node Biopsy, are considered in the case of neck dissection for head and neck cancer.

Surgeons from MD Anderson Cancer Center, Houston, Texas, began performing dissections of only those node groups at highest risk of harbouring metastatic disease. They called this operation modified neck dissection[19].

Currently still indicated for staging purposes in N0 necks, there are many reports on the therapeutic use of Selective Neck Dissection for node-positive necks with valuable results[1,3,4,6,13,27,29,31,41].

Nowadays Selective Neck Dissections are being given more room, especially in countries like the USA where, for insurance and legal reasons, giving less morbidity is a major concern[8], whereas in many other countries Modified Radical Neck Dissection is still preferred because, though rare, metastases in unusual levels are a possibility[5,24,28,36,38].

The findings from Byers[5] are one of the reasons why Selective Neck dissection nomenclature was revised in 2001 to eliminate names such as Supraomohyoid Neck Dissection. The various Selective Neck Dissections are now distinguished by indicating which levels are removed (e.g. SND (I-IV) instead of Anterolateral Neck Dissection[34].

Byers discovered that cancers of the tongue margin can give "skip metastases" to level IV. Selective Supraomohioid Neck Dissection was the insufficient in these cases. With this in mind, many surgeons started performing an "extended" Selective Supraomohioid Neck Dissection that included level IV in these cases. This kind of Selective Neck Dissection is now called SND (I-IV).

Spinal accessory nerve

Another object of discussion is identification of the spinal accessory nerve. There are still recent reports that advocate its identification around Erb's point[23].

From classical anatomical descriptions we know the course of the Spinal Accessory Nerve posteriorly to the Sternocleidomastoid muscle.

We have two main surgical landmarks to identify it in the posterior triangle of the neck:

1. Erb's point: the point were the Great Auricular Nerve crosses the Sternocleidomastoid muscle to reach the subcutaneous plane. The Spinal accessory Nerve is Located within 1 cm from this point in a deeper plane;

2. the point of entry of the nerve into the anterior margin of the Trapezius muscle[39].

Neck dissection classification

The classification of neck dissection universally adopted is the one proposed by the American Head and Neck Society and the American Academy of Otolaryngology-Head and Neck Surgery, published in 2002[34].

Even if already published, this classification seems to be still not universally adopted. Many still use the classification of 1991[33]. So the classification is reported again here in an attempt to give it more diffusion.

This paper was presented, on July 2005, at the 8th Meeting of the European Association of Clinical Anatomy[12]. It deserves mention that the audience, made of specialists of various disciplines (including Head and Neck surgeons) coming from many European and non-european countries, was surprised by this "new" classification of neck dissection.

According to this classification neck dissection is divided as follows:

• Radical Neck Dissection: removal of all the lymph nodes from level I through V, including the Spinal Accessory Nerve, the Internal Jugular Vein and the Sternocleidomastoid muscle;

• Modified Radical Neck Dissection: removal of all the lymph nodes routinely removed in a Radical Neck Dissection, with preservation of one ore more non-lymphatic structures. The structures preserved must be indicated (e.g.: Modified Radical Neck Dissection with preservation of the Spinal Accessory Nerve and the Internal Jugular Vein).

• Selective Neck Dissection: Neck Dissection that preserves one or more of the lymph node groups routinely removed in a Radical Neck Dissection. The Groups Dissected must be indicated (e.g. SND (II-V));

• Extended Neck Dissection: removal of one or more lymph node groups or non-lymphatic structures not routinely removed in a Radical Neck Dissection.

Conclusions

Management of the neck is crucial in head and neck cancer. For this reason, wise behaviour, in accordance to international guidelines, must be adopted.

Failure to achieve loco-regional control may infact have devastating impact on the prognosis of these patients.

Furthermore, treatment of head and neck cancers has become multidisciplinary and cooperation between the components of the multidisciplinary team comes through adoption of common language.

This is why correct nomenclature and classification has to be adopted. And it must also be up-to-date.

The need to address the issues discussed in this paper comes from the observation that too often, especially in smaller, peripheral centers, mistakes are made in the treatment of these patients. Hopefully, some of these can be avoided.

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