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Local anesthetic infiltration vs. nervous blocks in face's skin lesions: What's new?

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Introduction

Skin tumors are the most common type of cancer. They are localized throughout the body, more frequently in those regions chronically exposed to sun, like face, scalp and neck, compromising aesthetic appearance. Non-melanoma skin tumors are the most numerous occurring; based on the AIRTUM report (Associazione Italiana Registro Tumori), men are predominantly interested, while in woman is second only to breast cancer. 120 new cases on average of non-melanoma are registered every 100,000 men and 90 cases every 100,000 women [1,2].

Each year in the US, nearly 5 million people are treated for skin cancer; there are more new cases of skin cancer than the combined incidence of breast, prostate, lung and colon cancer. Between 1992 and 2006 non melanoma skin cancers increased by nearly 77%. The annual cost of skin cancers in the US is estimated at $8.1 billion: about $4.8 billion for non-melanoma skin cancers and $3.3 billion for melanoma. Between the period 2002-2006 and the period 2007-2011, the average annual cost for skin cancer surgery increased more than 126 percent, compared to 25.1 percent for all other cancers [3-6].

The optimization of day hospital surgical procedures is mandatory, to avoid erroneous indications, insufficient intra operative comfort and prolonged recovery. New guidelines should be discussed and shared. Currently, guidelines for the plastic surgery in general anesthesia are present; as far as surgery in loco-regional anesthesia is concerned, the standard patient's selection is inadequate. Except expanded lesions which contraindicate local infiltration or anesthetic blocks, clinical and emotional patient's characteristics are the reference parameters, to choice between loco-regional and general anesthesia.

Professional collaboration between plastic surgeon or ophthalmologist and anesthetist in ambulatory plastic surgery setting, is essential for inpatient's reduction, lowering costs, recovery times and postoperative infections. In Italy, numerous ophthalmologists are expert in face's skin lesions, particularly the periocular one's, because of their practice in microsurgery with magnifying binocular lens and microscope.

Regional blocks get the maximum benefit with reduced local anesthetic volume, without altering the anatomical relationship, permitting an adequate bleeding control, in absence of edema of close tissues [7,8]. Mild sedation with benzodiazepine in adults during surgery reduces anxiety, postoperative nausea and vomiting, shivering, gastric secretions, easing surgeon's task. Moreover, it doesn't interferes on the postoperative discharge: a Cochrane review analyzed 17 studies in day Case surgery, with no difference in time to discharge from hospital [9,10].

Local Anesthetics

Table 1: Types of skin lesion.

Skin lesion	Males (n. 43)	Females (n. 57)
Cysts	5	7
Premalignant lesions	12	10
Benign Nevus	3	5
Basal cell carcinoma	14	23
Squamous cell carcinoma	5	8
Melanomas	4	3

Local anesthetics (LAs) are molecules with different clinical and pharmacological characteristics; the ideal LA should provide painless and effective analgesia with rapid onset, prolonged

duration, and minimal side effects (Table 1). They belong to two groups: esters and amides. The amino esters are relatively unstable in solution; one of its metabolite is para-aminobenzoic acid (PABA), which cans determine allergic reactions in a small percentage of patients. In contrast, the amides are much more stable, less allergenic and undergo enzymatic liver degradation.

Among amides, the most commonly used are: bupivacaine, etidocaine, lidocaine, mepivacaine, prilocaine, ropivacain. Mepivacaine, with rapid onset, intermediate duration and toxicity, because of its intrinsic vasoconstrictive properties, is less rapidly washed out by tissue blood flow. Pain during injection can be influenced by pH of the anesthetic solution; sodium bicarbonate addition attenuates pain, shortening the onset. Nervous block vs multiple infiltrative injections of anesthetic may be more advantageous, in case of highly sensitive body's regions; rapid infiltration of cool anesthetic mixture may be painful or toxic [11,12].

When nerve block is performed, extraneural or paraneural interspace are injected, with complete distal anesthesia of nerve's territory; the sympathetic blockade, with peripheral vasodilatation, can increase intra operative bleeding. Face's nerve blocks needs great anesthesit's familiarity with the nervous system anatomy, avoiding intravascular injection and direct nervous lesions with the needle. Supraorbital, supratrochlear, infraorbital, maxillary and mental nerve block provide adequate anesthesia nearly all over the face. The optimum sites for achieving supraorbital and suprathroclear nerves are, respectively, located approximately 3 mm lateral and 3 mm medial to the vertical line through the apex of lacrimal caruncle along the supraorbital margin [13].

Supraorbital nerve, a branch of ophthalmic nerve, determines anesthesia of upper eyelid and medial forehead; In difficult cases, sonography can help the anesthetist in identifying the supraorbital notch or the foramen [14].

Supratrochlear nerve block, branch of the frontal nerve, includes numb of the mid forehead. Ultrasound, in case of forehead augmentation, afferent region of supraorbital and supratrochlear nerves, was tested in cadavers, for evidencing arterial vascularization, improving the safety of surgery [15].

Infraorbital Nerve, terminal branch of the maxillary nerve, Produce lower eyelid, medial cheel region or upper lip anesthesia. Recent experimental study suggests that infraorbital foramina can be successfully located; the infraorbital foramen is easily located using ultrasound and an «in-plane» ultrasound-guided technique for infraorbital nerve blockade is feasible on the model [16,17].

Mental nerve, branch of the mandibular nerve, is a lateral branch of inferior alveolar nerve, determines sensitive cutaneous and mucosal innervations of lower lip and chin. Midline skin lesion needs bilateral block. Ultrasound mental foramen identification is feasible, with some limitations in elderly, in previous mandibular surgery/trauma or missing teeth between the lower first molars [18].

Maxillary nerve, one of the three branches of trigeminal nerve, anesthetizes the skin of the midfacial region, the lower eyelid, nasal area and upper lip, besides the mucosa membrane of nasopharynx, maxillary sinus, soft palate, and palatine tonsil, roof of the mouth, the maxillary gengivae and maxillary teeth. The anterior ultrasound approach for the maxillary nerve block is more comfortable, the landmarks are easy to identify, with low risk for vascular injury [19].

Materials and Methods

From January 2015 to January 2016 one hundred patients with facial skin tumors were randomized in a prospective study at the Plastic Surgery Department, University Sapienza of Rome, Italy, and Sant'Andrea Hospital. Skin lesions were classified in benign, pre-malignant and malignant (Table 1).

Patients were divided in two groups:

i. Group A of 50 patients, 21 male and 29 female, age 65 ±9, ASA I – III (10/19/21), weight 68±11 kg, height 160±8, with anesthetic Local Infiltration (LI);

ii. Group B of 50 patients, 16 male, 34 female, age 68 ±10, ASA I – III (9/22/19), weight 64 ± 9 kg, height 158 ±11, with nerve block (NB).

The purpose of our study is to evaluate the analgesia level, compliance and complication rate after LI or selective NB with alkalinised mepivacaine cloridrate 2%, Guardant® (Table 2). LI was realized by the same plastic surgeon with needles BD Microlance™ 3 23G x 30 mm or Micro Tip Ultra® 25G x 16 mm; NB by the same anesthesist, with BD Microlance™ 3 27G x 19 mm or 26G x 13 mm. Overall were done: 13 Supraorbital NB, 10 Supratrochlear NB, 7 Infraorbital NB, 12 mental NB, 8 Maxillary NB. Total injected LA volumes, onset times, average anesthetic duration and comfort are reported in (Table 3). In 7 cases (4M – 3F), NB was bilateral (4 mental and 3 supratrochlear).

Table 2: Casistic.

Parameters	Group A n. 50	Group B n. 50
Age	65 ± 9	68 ± 10
M / F	21 / 29	16 / 34
ASA I – II – III	7 / 26 /17	9 / 27 / 14
Weight (kg)	68 ± 11	64 ± 9
Height (cm)	160 ± 8	158 ± 11
Size of lesion (mm)	23 ± 11	25 ± 14
Duration of surgery (min)	47 ± 18	51 ± 23
LA volume injected (ml)	7.5 ± 4.5	3.1 ± 1
Duration of anesthesia (min)	47 ± 8	51 ± 21

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Table 3: Nervous blocks and local infiltration Parameters.

	Supraorbital n. 13	Supratrochlear n. 10	Infraorbital n. 7	Mental n. 12	Maxillary n. 8	Infiltration n. 50
Injected LA (ml)	2 –3	1 – 2	1 – 2	2 – 3	4 – 6	5 - 15
Onset time (min)	3 – 5	3 – 5	4 – 6	3 – 5	4 – 8	8 – 15
Duration anesthesia (min)	40 – 65	35 – 65	35 – 60	30 – 55	45 – 65	20 – 40
Comfort	3 – 4	3 – 4	3 – 4	3 – 4	2 – 3	1 – 3
Bleeding	-	-	1	1	-	7
Pain	-	-	-	-	1	6

Ultrasound (Sonosite Nanomaxx™ with L38n/10-5MHz Transducer) helped the anesthetist in visualizing and locating the output nerve's foramen, notches and its relationships with close tissues, to decrease the risk of vascular injection and nervous lesion. All patients were premeditated with midazolam 0.02 mg/kg/e.v. Patients receiving anticoagulants (dicumarols) made a "bridging therapy" with low molecular heparin three days before surgery. Those taking Antiplatelet agents (acetylsalicylic acid, ticlopidine, clopidogrel) suspended therapy 3/5 days before surgery.

ECG, HR, NIBP and SpO2 were monitored during surgery. Side effects and complications based on anesthesia and surgery were listed, with special caution to nerve damages (paresthesia, dysesthesia). Central nervous system and cardiovascular system toxicity signs were observed during loco-regional anesthesia and the intra operative period. In case of local infiltration, maximum dose of 7 mg /kg /90 min for buffered mepivacaine cloridrate was considered. The average comfort patient's level during surgery was evidenced with a four-step scale (1-low, 2-insufficient, 3-good, 4-excellent).

Exclusion criteria were: patients with stabilized ASA III, with predisposition to malignant hyperthermia, BMI > 35, physical or mental dependence, neurological deficit of afferent region, allergy to local anesthetic, infection of injection site, refused of loco-regional anesthesia. Patient's discharge time was reported. Primary endpoint was analgesic result, based on two loco-regional anesthesia technique, local infiltration and nervous block, comparing anesthetic's onset-time, duration and intra operative bleeding. Secondary end point was ultrasound assistance impact about anesthetic technique and possible critical issues for hospital discharge. Statistic with the Student t test for unpaired data and Fisher's exact test were analyzed.

Results

Demographic data, ASA physical stauts, size of lesions, surgery, anesthesia durations and volume of LA injected were analyzed. Fisher's exact test and Student's t test were used; $P \leq 0.05$ was considered statistically significant. No differences in age (65 ± 9 vs 68 ± 10 years), weight (68 ± 11 vs 64 ± 9), height (160 ± 8 vs 158 ± 11 cm), size of lesion (23 ± 11 vs 25 ± 14 mm), duration of surgery (47 ± 18 vs 51 ± 23 minutes) were detected in two groups ($p > 0.05$). As obvious, anesthetic volume in LA group was higher than in NB ($5 < LI < 15$ ml vs. $1 < NB < 6$ ml), as well as long lasting anesthesia in group NB was obtained ($30 < NB < 65$ min vs $20 < LI < 40$ min), ($p < 0.05$). Intra operative comfort was $2 < NB < 4$ vs. $1 < LI < 3$.

Among side effects, 9 cases of intra operative bleeding (7 in LI group and 2 in NB group), 1 case of paresthesia seven days after surgery by mental nerve block and 3 patients with postoperative hematomas (LI group). In 4 cases, a Z-flap of the frontal region was necessary, without additional anesthesia (NB group).

Six Patients reported in sufficient intra operative analgesia after local infiltration vs 1 case after maxillary nerve block; Ketoprophen 200 mg/8-12 hour, or Ibuprofen 1200 mg/day or Paracetamol 1g/8 h, when necessary, were administered.

No patient was rehospitalized; 6 patients called the hospital asking for counseling about home therapy and wound dressing.

Discussion

Loco-regional anesthesia represents, doubtless, the reference option in adult skin tumours; face nerves targeting is the anesthesit's commitment, for the loco-regional technique. Plastic surgeon's familiarity with local anesthetic infiltration and patients quick turnover during ambulatory plastic surgery, may support local infiltration vs. nervous block, as far as intra operative analgesia is concerned. Ophthalmologist's more demanding contraindicates local infiltration, because of its higher impact on bleeding and removing periocular lesions with the microscope. Anesthesist must be able to satisfy facial nerves blocks techniques and sedation, with limited delayed hospital discharge.

Nervous face's blocks are known to be a good alternative to local anesthetic infiltration, in particular for extensive and deep skin lesions, which can be blocked with one or few injections. [7, 8, 11] They are considered as easy to learn, with lower risks for nerve's lesions and tissues damages. For instance, half or the whole forehead can be anesthetized mono or bilaterally, with little anesthetic's volume, able for flaps after extended skin tissue removal; with local infiltration, tissues relationships may be subject to deformation of cutaneous border, with more difficulties for surgeon and unsatisfactory healing process.

When local anesthetic duration is shorter than surgery, nervous block can be done again, without wound's border alteration. When

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local infiltration is adopted, repeated anesthetic injections are contraindicated and inadequate; surgical wound, when bleeding is present, determines anesthetic solution drainage, simultaneously with blood, shortening the time of anesthesia. Therefore, sedative drugs are necessary to tacitate intra operative pain and to conclude surgery.

In elderly patients, sedation can lengthen the time to hospital discharge of outpatient care, because of its longer metabolization; for this reason, sedation should be avoided, preferring a nervous block, when local infiltration was previously done. Intraoperative bleeding can be attributed to different factors: the possible persistence of anticoagulation therapy effects, increase in blood pressure, insufficient homeostasis. Difference between the two anesthetic's techniques interests better bleeding vessels localization and their targeted cauterization, in case of nervous block. After local anesthetic's infiltration, bleeding can be profuse, all over the wound, with problems to border the source itself.

After mental nerve block, one case of paresthesia was reported, without distance reliquates, although ultrasound control was employed. Ultrasonography helps the anesthetist to see landmarks of nervous output from mental foramen and its cutaneous distance, preventing in congruous nerve puncture.

Face's nerves are not visible with ultrasound, because of their small size; blind cutaneous landmarks may be difficult and insufficient, causing excessive local anesthetic volume injection and possible nervous lesions. Ultrasound evidenced the nerve's output foramen and the correct distance between cutaneous plane and foramen or notch; they were both nerve's indirect landmarks, influencing the anesthetic volume necessary, avoiding toxic reaction after wide local infiltration.

Outpatients receiving loco-regional anesthesia need to satisfy discharge criteria of ambulatory surgery: this includes a good degree of mental alertness, adequate analgesia, absence of nausea and vomiting, and the ability to deambulate. Signs of toxic reactions to anesthetic were not evidenced; frequently residual anesthesia didn't represent a citeria for delayed discharge. In case of algogenic surgery (flaps, periocular lesions), a further nervous blockade with long-lasting local anesthetic could be considered, to modulate post-operative pain therapy.

The buffered steady mepivacaine contributed to improve comfort, both in occasion of local infiltration or nerve's block, shortening onset time; we used a pharmacetic buffered compound, with steady pH, devoid of any salt deposit. Duration of anesthesia was higher in group B, notwithstanding a ratio about 1:5 as far as anesthetic volume is concerned; this is because nervous peripheric afference needs more anesthetic than nerve's block.

Conclusion

Differences between sufficient anesthesia and an excellent one is closely related to many small details, which can guarantee a good result, in terms of safety and analgesia, intra operative comfort for the patients, a bloodless situation for surgeon, with lower risk of nerve lesions and toxic reaction with the anesthesia adopted. Ultrasound completed and confirmed the correct position of needle before anesthetic's injection.

Both anesthetic techniques ensured good analgesia, but only nerve's blocks were be able to determine satisfactory intra operative patient's comfort, a bloodless wound and weak risk for nervous lesions and toxic reaction to local anesthetic.

In conclusion we can summarize the cornerstones for a shadow less loco-regional anesthesia: a nerve's block with buffered anesthetic solution, ultrasound guided, with mild sedation and absence of bleeding.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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