www.jpnim.com Open Access eISSN: 2281-0692
Journal of Pediatric and Neonatal Individualized Medicine 2015;4(2):e040249
doi: 10.7363/040249
Published online: 2015 Oct 26

Selected Abstracts of the 11th International Workshop on Neonatology

FROM THE WOMB TO THE ADULT

CAGLIARI (ITALY) · OCTOBER 26TH-31ST 2015

The Workshop has been organized with the patronage of the Italian Society of Neonatology (SIN), the Italian Society of Pediatrics (SIP), the Italian Society of Perinatal Medicine (SIMP), The Italian Federation of Pediatricians (FIMP), the Union of European Neonatal and Perinatal Societies (UENPS), the Union of Mediterranean Neonatal Societies (UMENS), the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC), and lastly the Italian National Observatory of Residents in Paediatrics (ONSP).

WORKSHOP'S PRESIDENTS

Vassilios Fanos (Cagliari, Italy), Michele Mussap (Genoa, Italy), Antonio Del Vecchio (Bari, Italy), Bo Sun (Shanghai, China), Dorret Boomsma (Amsterdam, the Netherlands), Gavino Faa (Cagliari, Italy), Antonio Giordano (Philadelphia, USA)

WORKSHOP'S HONORARY COMMITTEE

S. Bernardini (Rome, Italy), D.I. Boomsma (Amsterdam, the Netherlands), G. Buonocore (Siena, Italy), E. Burgio (Bruxelles, Belgium; Arezzo, Italy), M. Burlea (Bucarest, Romania), G. Castaldo (Naples, Italy), I. Cetin (Milan, Italy), G. Chiamenti (Verona, Italy), G. Corsello (Palermo, Italy), J.R. De Langhe (Ghent, Belgium), G.C. Di Renzo (Perugia, Italy), G. Donzelli (Florence, Italy), C. Fabris (Turin, Italy), M. Ferrari (Milan, Italy), A. Giordano (Philadelphia, USA), G. Guerrera (Genoa, Italy), M. Hod (Tel Aviv, Israel), L. Indinnimeo (Rome, Italy), G.B. Melis (Cagliari, Italy), L. Memo (Belluno, Italy), G. Mercuro (Cagliari, Italy), G. Monni (Cagliari, Italy), C. Moretti (Rome, Italy), J.-C. Picaud (Lyon, France), D. Pisano (Cagliari, Italy), M.G. Privitera (Rome, Italy), L. Ramenghi (Genoa, Italy), C. Romagnoli (Rome, Italy), L. Scarpa (Cagliari, Italy), A. Staiano (Naples, Rome), M. Stronati (Pavia, Italy), B. Sun (Shanghai, China), S. Vendemmia (Aversa, Italy), A. Villani (Rome, Italy), M. Yurdakök (Ankara, Turkey), Luc Zimmermann (Maastricht, the Netherlands)

WORKSHOP'S INTERNATIONAL FACULTY

D. Boomsma (Amsterdam, the Netherlands), G. Buonocore (Siena, Italy), E. Burgio (Bruxelles, Belgium; Arezzo, Italy), M.J. Bennett (Philadelphia, USA), M. Burlea (Bucarest, Romania), L. Cataldi (Rome, Italy), G. Corsello (Palermo, Italy), J.R. De Langhe (Ghent, Belgium), G. Faa (Cagliari, Italy), V. Fanos (Cagliari, Italy), M. Ferrari (Milan, Italy), A. Giordano (Philadelphia, USA), L. Gortner (Homburg, Germany), D. Grapov (Los Angeles, USA), G. Guerrera (Genoa, Italy), M. Hod (Tel Aviv, Israel), C. Maretti (Lugano, Switzerland), G.B. Melis (Cagliari, Italy), W.W. Minuth (Regensburg, Germany), C. Moretti (Rome, Italy), F. Mosca (Milan, Italy), M. Mussap (Genoa, Italy), J.-C. Picaud (Lyon, France), M.G. Privitera (Rome, Italy), S. Rezzi (Lausanne, Switzerland), C. Romagnoli (Rome, Italy), M. Somaschini (Lugano, Svizzera), M. Spraul (Rheinstetten, Germany), M. Stronati (Pavia, Italy), B. Sun (Shanghai, China), K. Yurdakök (Ankara, Turkey), M. Yurdakök (Ankara, Turkey), Luc Zimmermann (Maastricht, the Netherlands)

SATELLITE MEETINGS' PRESIDENTS

Irene Cetin (Milan, Italy), Giampietro Chiamenti (Verona, Italy), Joris R. Delanghe (Ghent, Belgium), Antonio del Vecchio (Bari, Italy), Gian Carlo Di Renzo (Perugia, Italy), Gavino Faa (Cagliari, Italy), Vassilios Fanos (Cagliari, Italy), Maurizio Ferrari (Milan, Italy), Antonio Giordano (Philadelphia, USA), Gian Benedetto Melis (Cagliari, Italy), Michele Mussap (Genoa, Italy), Giovanni Ottonello (Cagliari, Italy), Denis Pisano (Cagliari, Italy), Melania Puddu (Cagliari, Italy), Bo Sun (Shanghai, China), Murat Yurdakök (Ankara, Turkey)

AS A FAMILY-CENTRED SUPPORTIVE INTERVENTION

N. Bertoncelli

Neonatal Intensive Care Unit, Modena, Italy

The prematurely born infant is probably the most vulnerable patient in our hospitals due to his or her immaturity. The impact on brain development of the exposure to stressors in the neonatal intensive care unit (NICU) makes premature infants even more fragile. For this reason, over recent years, the importance of developmentally supportive care has become extremely important.

The multidisciplinary-based care philosophy, called developmentally supportive care, has evolved along with the ever-increasing success in treating severely ill or extremely prematurely born infants. With this success, there has been growing attention to long-term medical and mental health, as well as the neurobehavioral and of the survivors. Infant and family-centred developmentally supportive interventions aim at reducing stress and providing pain treatment, support the self-regulation of the infant and promote parental presence and involvement in the care of their baby.

Newborn Individualized Developmental Care and Assessment Program (NIDCAP) is the only infant and family-centred developmental supportive intervention designed to be implemented right from the moment of birth. It is also unique because it promotes a systems perspective of the care of the infant and his or her family, the environment around the infant and the assessment of the needs of the infant and his or her family through naturalistic behavioral observations aimed at formulating recommendations on how to adjust the care or the environment appropriately in a supportive way.

By enhancing the ability to read the behavioral cues of the infant and understand his or her strength and sensitivity, the general knowledge and competence of parents and staff members is enhanced. This approach makes parents and staff capable of facilitating the stability and well-being of the infant and improve his or her coping with stressful situations by supportive actions.

ABS 31

FROM ADULT TO PEDIATRIC RADIOLOGY. ENTROPY-BASED IMAGING ALGORITHMS FOR APPLICATIONS IN PEDIATRIC MEDICINE

A. Casanova[1], C. Cabula[5], L. Barberini[4], L. Tusa[3], M. Puddu[3], V. Ruggiero[2]

[1]*Department of Informatics and Mathematics, University of Cagliari and Department of Informatics AOUCA Universitary Hospital of Cagliari, Cagliari, Italy*

[2]*Department of Medical Sciences "Mario Aresu", AOUCA Universitary Hospital of Cagliari, Cagliari, Italy*

[3]*Department of Informatics Services, AOUCA Universitary Hospital of Cagliari, Cagliari, Italy*

[4]*Department of Public Health Clinical and Molecular Medicine, University of Cagliari, Cagliari, Italy*

[5]*Surgical Oncology, Oncological Hospital "A. Businco", Cagliari, Italy*

SUMMARY

Ionizing and non ionizing radiation imaging techniques are still under study to increase sensitivity and specificity in the diagnostic process. Specific protocols can be used to reduce the pediatric patients dose in case of ionizing radiation use in the imaging diagnosis process maintaining or increasing the quality of the images; several international task groups are working to improve the application condition of imaging analysis. Performances can be improved both on the side of the radiation properties and on the side of images improvement quality. But there is a third source of performances improvements: the reading of images. Generally specking, images diagnosis is difficult because, despite the basic anatomy being virtually identical from image to image, the degree of natural variation in both normal and abnormal structures is quite high. Radiologists will never see all the possible variations however long they practice or however many images they view. In the last twenty years, much research has been carried out to develop computerized methods to assist radiologists in differentiating benignant from malignant findings in the images. Using a computer aided diagnosis (CADx) scheme, radiologists could benefit from computer output while formulating their opinion. Most promising algorithms for the CAD analysis are based on the concept of entropy. Entropy-based CAD approach produces a great benefit in the Textural Features extraction in the imaging diagnosis process; for example, it is possible to improve Classification of Pediatric Posterior Fossa Tumors. Further, Entropy-based CAD approach in the Diffusion tensor-imaging (DTI) technique could allows to radiologists to create a powerful database with retrospective motion correction for large-scale pediatric imaging. These and others findings suggest an added diagnostic value of quantitative

feature analysis of imaging by entropy-based CAD approach in a particularly sensible field of Medicine like the pediatric neuro-oncology. We report some of the most recent results in the topics to introduce once again the importance of the ICT technology in the modern clinical Medicine.

INTRODUCTION

The diagnosis process in Medicine is complicated by the lack of sensibility and specificity of the criteria adopted for. Also in the powerful and promising imaging diagnostic process several factors affect the evaluation of the findings. Mathematicians, Physicists, Informaticists and Technologists have increased the cooperation in the Medicine applications and all the process have gained by this multidisciplinary approach. Recently, the new automatized process of images reading has produced interesting results in the support to the Physicians in the diagnostic process. These algorithms are able to mining latent informations contained into the images, especially in the multimodal images likes the ones extracted by powerful techniques like the Magnetic Resonance. Further, in the field of the ionizing radiation imaging, the ability to extract more information from images allows the reduction of patient dose. The increase of information from the images for the diagnostic allows the increase of sensibility and specificity for the diagnostic process. A promising class of these algorithms are the entropy-based approaches; particular definition of the 1D or 2D images signals entropy can be used to detect latent findings in the images useful for the diagnosis. Further the automation of this process increase the ability of the "reader" to maintain the higher attention on the single image acquired avoiding the "false negative" errors in the diagnosis process. The concept of entropy has been developed in thermodynamics in order to characterize the ability of a system in changing his status. Measures of system entropy are usually functions defined in the phase space and they reach the maximum or minimum value depending on the contextual definition, whenever system variables are uniformly distributed. It is related to the disorder degree. This concept has been borrowed in communication systems for coding purposes and data compression. Entropy based functionals have been also adapted in image and signal analysis to perform deconvolution and segmentation, to measure the pictorial information and to better define image differences. From the mathematical point of view it is really interesting the studies about the definition of the entropy concept for an image. We have proposed a novel definition of the entropy for the images in our study in the Rx imaging in the breast cancer studies. Properties of this innovative calculation method from the entropy are quite promising for the application in pediatric radiology especially for the neurological applications. Some of these properties have the capability of being correlated with other diagnostic information enhancing the sensibility and the specificity of the diagnosis. We are testing the performances of a possible approach associating the predictive value of a tumor marker as plasma osteopontin with the analysis of entropy in mammograms of patients with microcalcifications (MCs). Osteopontin is a malignancy associated protein detectable in plasma and tumor tissue; in patients with breast cancer high levels are associated with the presence of mammographic calcifications and are correlated with aggressive histology, poor prognosis and shorter survival. Breast cancer (B.C.) represents a major cause of death in women and is exceeded only by that of the lung. The degree of disorder (entropy) of the image is an important indicator; in fact the texture disorder (parenchymal tissue structures) in the suspicious region of the image represents a significant component for a physician in the diagnosis of malignancy or benignancy. In our study [1] we evaluated mammograms and plasma osteopontin levels (immunoenzymatic method) of two women (enrolled at Oncologic Hospital "A. Businco", Cagliari, Italy) with mammographic microcalcifications (MCs) (**Tab. 1**).

Each mammogram was studied separately evaluating the entropy of areas with very limited and connected dimensions. Different 120 x 120 pixel regions were selected in each mammogram so that each region contained healthy parenchyma and the zone with MCs. At least 6 regions were selected for each mammogram. Each region was then subdivided into 15 x 15 pixel contiguous and connected under-regions, thus obtaining 64 tiles. We associated the equivalent entropy value and the standard deviation of the entropy to each tile of the region. Osteopontin levels was 100 ng/ml in patient with malignant MCs and 37 ng/ml in patient with benignant MCs. The entropy trend is showed in **Fig. 1** for patient with malignant MCs and in **Fig. 2** for patient with benignant MCs. Analyzed tiles from each mammogram are reported

Table 1 (ABS 31). Evaluation of mammograms in two women.

Patient	Age	Mammogram	Hystology
D.A.	72	Malignant MCs	DCIS
C.R.	61	Benignant MCs	Normal

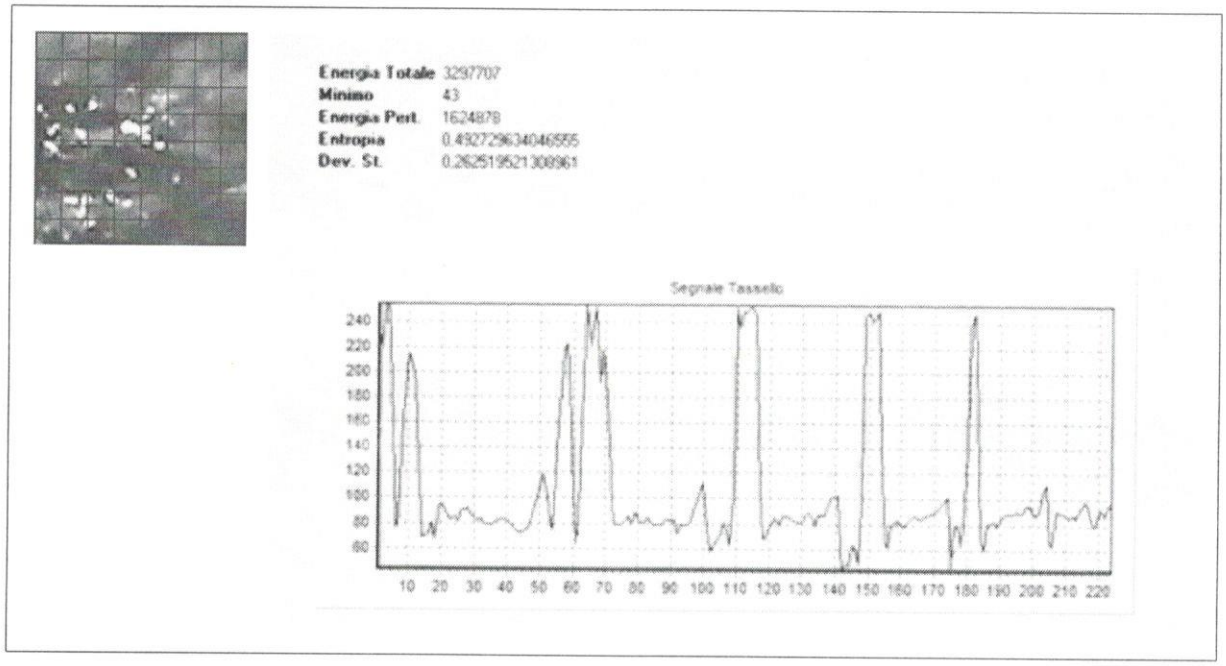

Figure 1 (ABS 31). Entropy trend in patient with malignant microcalcifications (on the right side the mammogram tiles evaluated).

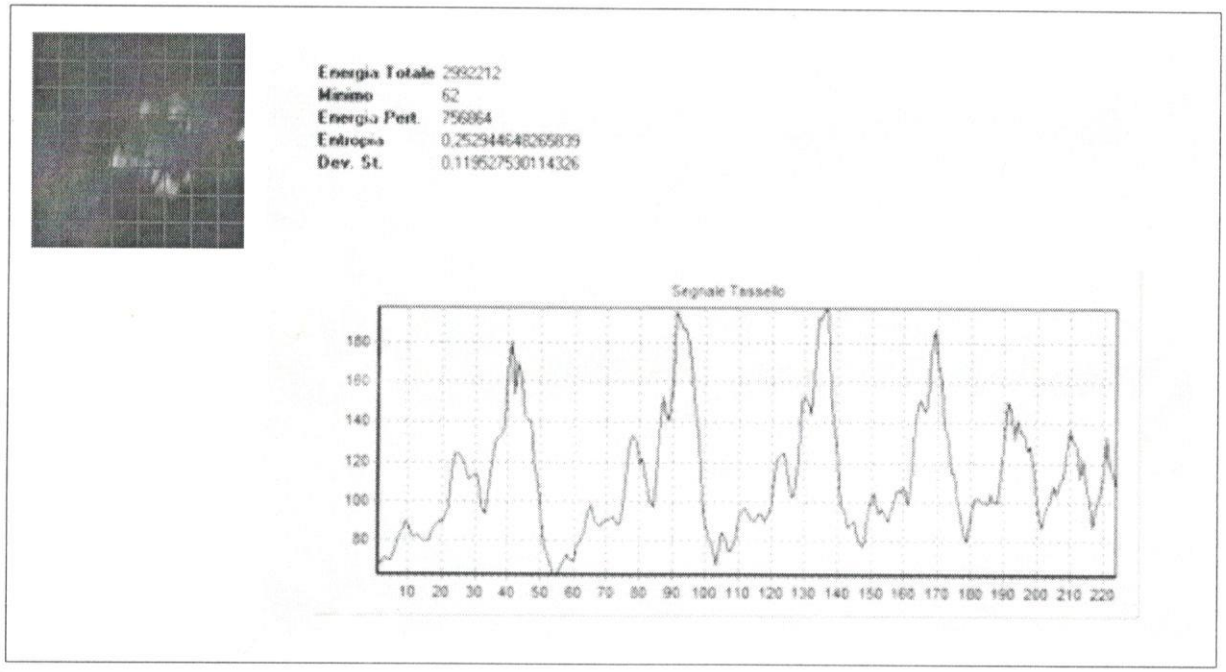

Figure 2 (ABS 31). Entropy trend in patient with benignant microcalcifications (on the right side the mammogram tiles evaluated).

in **Tab. 2**. Signal data of 2 tiles are reported: tile number 36 for malignant MCs and tile number 36 for benignant MCs.

Indeed, it is very difficult to compare the distribution of the grey tones (texture), their value, the possible order or disorder of an area of the mammogram with another area of the same mammogram. Our testing, presented briefly in the previous paragraph, has shown how the entropy measure can be an excellent aid to evaluate and to confront such measures.

Table 2 (ABS 31). Results obtained from signals selected on malignant and benignant areas of MCs in mammograms examined.

	Malignant MCs	Benignant MCs
Etot	3,297,707	2,992,212
Ep	1,674,878	756,864
S	0.049	0.025
Sqm	0.26	0.11

In fact, we noticed that in case of malignant masses, the entropy assumes very high values around the edges of the lesion, while it assumes very low values within the same mass. The entropy standard deviation assumes very high values if compared to a benignant mass. In the case of benignant masses, we observed that there are no major entropy alterations on the whole image taken into consideration, as it also shows a reduced value of the standard deviation. We believe that, with the arrival of the digital mammography, the recourse to entropy measure in different areas, could be a valid aid for the radiologist to formulate diagnosis.

Since the method works in almost real time, the radiologist can choose which and how many areas to confront, the sizes of such areas, the sizes of the areas to evaluate etc.

He can obtain indications as to the nature of the mass under analysis from the trend of entropy measurements. The obtained experimental data show that in the case of benignant masses contained in a mammogram, there are no structural variations, whilst in the case of malignant masses, in the area of the mass, there is a different structure from that of the surrounding parenchyma, defined by areas with high entropy values.

Table 2 shows that it is not important total signal energy (that is strongly affected by image acquisition) as well as perturbation energy, entropy and square deviation. The last are much more high in malignant MCs with a strong increment of the perturbation energy. It is important to notice that the value of the perturbation with respect to the malignant lesion is about twice of the value corresponding to the benignant. In addition the mean square deviation with respect to the malignant MCs is about twice the value corresponding to the benignant MCs. Finally the entropy value of the malignant MCs is higher (0.049) than the corresponding benignant value (0.025).

Evaluation of osteopontin levels in association with entropy analysis of breast radiologic calcification might be an useful aid in the evaluation of microcalcification and provide an additional support for the choice of treatment strategy in women with mammographic calcification.

Texture analysis (TA) is a powerful approach to characterize and quantify the tumor matrix. TA features provide in previously suggested for tumor segmentation. In SVM classifiers, features are represented as n-dimensional vectors and combined to create a model of a particular class by using true and false training examples. Rodriguez-Gutierez et al. [2] proposed a paper for the description of an entropy-based metrics and textural features extraction on MRI Diffusion images to improve Classification of Pediatric Posterior Fossa Tumors. This retrospective study included preoperative MRI in 40 children with posterior fossa tumors (17 medulloblastomas, 16 pilocytic astrocytomas, and 7 ependymomas). Shape, histogram, and textural features were computed from contrast enhanced T2WI and T1WI and diffusivity (ADC) maps. Combinations of features were used to train tumor-type-specific classifiers for medulloblastoma, pilocytic astrocytoma, and ependymoma types in separation and as a joint posterior fossa classifier. A tumor-subtype classifier was also produced for classic medulloblastoma. The performance of different classifiers was assessed and compared by using randomly selected subsets of training and test data. The classifiers SVM coupled to texture analysis procedure has revealed a good level of sensibility for the classification of pediatric posterior fossa tumors. In our opinion the SVM ability to grades the tumors can be increased with a different definition of entropy as the one proposed by Vitulano et al. and applied to the breast tumor study.

The last application of entropy-based algorithm is the EPI-ghost correction derived from a set of T2-w data images applied in iterative calibration scheme. In brief, a constant offset and linearly increasing delay between even and odd bipolar EPI readouts was determined that minimized the total image entropy for each of the volumes analysed. This work was presented by Holdsworth et al. [3].

CONCLUSION

Entropy-based algorithms allow a dramatic improvement in the quality of imaging diagnosis process [4]. Further studies will give to the Radiologists the possibility to get much more informations from the imaging process in the Pediatric Radiology.

REFERENCES

[1] Casanova A, Distasi R, Fenu G. The Role of Entropy: Mammogram Analysis. ICIAP 2013.

[2] Rodriguez Gutierrez D, Awwad A, Meijer L, Manita M, Jaspan T, Dineen RA, Grundy RG, Auer DP. Metrics and textural features of MRI diffusion to improve classification of pediatric posterior fossa tumors. AJNR Am J Neuroradiol. 2014;35(5):1009-15.

[3] Holdsworth SJ, Aksoy M, Newbould RD, Yeom K, Van AT, Ooi MB, Barnes PD, Bammer R, Skare S. Diffusion tensor imaging (DTI) with retrospective motion correction for large-scale pediatric imaging. J Magn Reson Imaging. 2012;36(4):961-71.

[4] Casanova A, Savona V, Vitulano S. A novel entropy method for classification of biosignals. ICINCO – Proceedings of the Second International Conference on Informatics in Control, Automation and Robotics, Barcelona, Spain, September 14-17, 2005. Volume 4 – Signal processing, systems modeling and control. 2005, pp. 276-81

ABS 32

NCAM IS EXPRESSED IN THE METANEPHRIC MESENCHYME UNDERGOING MESENCHYMAL EPITHELIAL TRANSITION IN THE DEVELOPING HUMAN KIDNEY

E. Di Felice[1], D. Fanni[1], G. Senes[1], M. Fanos[1], R. Aprile[2], M. Piras[1], C. Gerosa[1]

[1]*Division of Pathology, Department of Surgery, University of Cagliari, Cagliari, Italy*

[2]*Division of Pathology, Department of Clinical Pathology and Transfusion Medicine, Ravenna, Italy*

BACKGROUND/AIMS

NCAM, also known as CD56, is a transmembrane protein expressed on the cell membrane of neurons, glial cells, neuroendocrine and muscle cells [1]. Recently, up-regulation of NCAM has been reported in renal stem/progenitors in the human adult kidney [2]. This study was aimed at analyzing NCAM expression in the developing human kidney.

METHODS

To this end, kidney samples from four human fetuses, rancing from 11 up to in weeks of gestation, were formalin-fixed and paraffin-embedded. 5 micron-sections were immunostained.

RESULTS

Reactivity for NCAM was restricted to the metanephric mesenchyme and to the early stages of the process of mesenchymal-epithelial transition. Immunostaining for NCAM was mainly observed in undifferentiated capsular cells and in mesenchymal cells located in close proximity of the renal capsule (**Fig. 1**). A membranous reactivity for NCAM characterized cap-mesenchymal cells adherent to

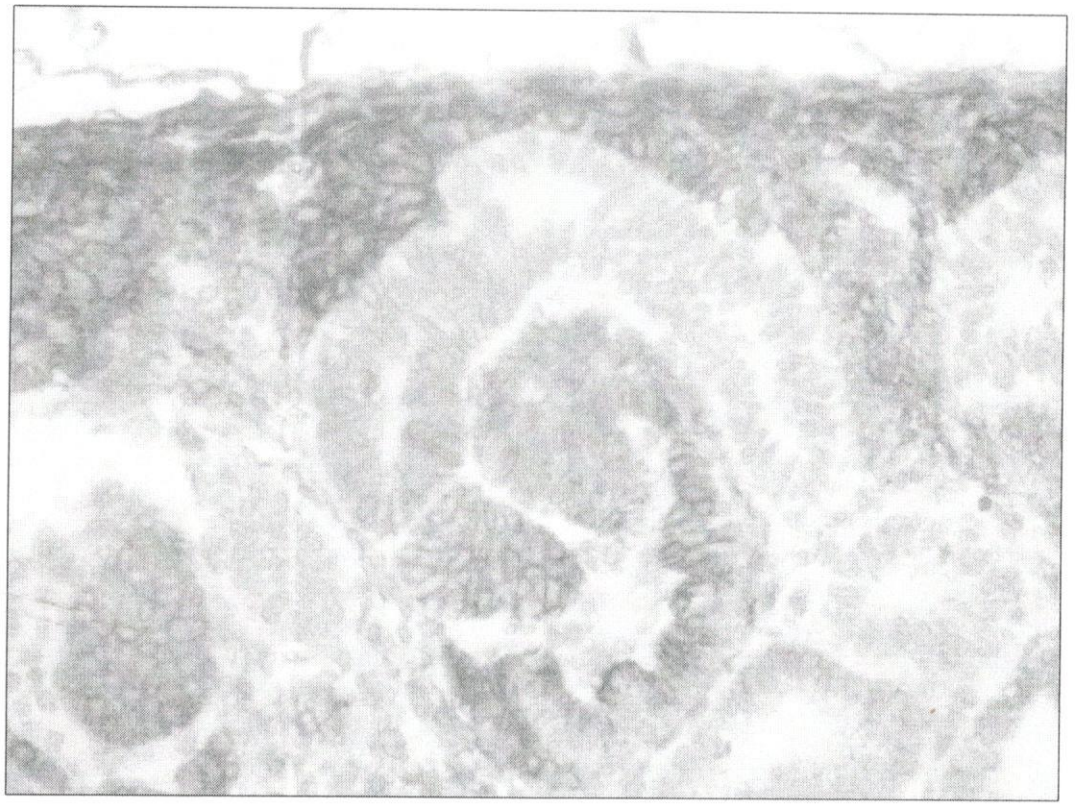

Figure 1 (ABS 32). Immunostaining for NCAM was mainly observed in undifferentiated capsular cells and in mesenchymal cells located in close proximity of the renal capsule.